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Europe Report

SCIENCE AND TECHNOLOGY

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22 JULY 1986

EUROPE REPORT

SCIENCE AND TECHNOLOGY

WEST EUROPE

SCIENTIFIC AND INDUSTRIAL POLICY

/7310

WEST EUROPE/ADVANCED MATERIALS

BRIEFS

ITALIAN MATERIALS RESEARCH CENTER--A Milan company is to lead the research into the metals of the future. Aerea, a small Milan company with a turnover of 6 billion lire operating in the aerospace sectors, will head some private companies in establishing the National Center for Research and Development of New Materials, to be set up in Lecce. The new center will comprise: the CNR, ENEL, ENEA, four companies located in Apulia, and the local authorities. The goal is to bridge the gap between Italy and other countries in an extremely important sector, that of the materials required both by the aerospace and the biomedical industry, as well as by the machine tool and mechanical industries. Research at the Apulian center will focus on the following areas: ceramics (which are being used increasingly in engine construction); semiconductors, which are of vital importance in the development of electronics; and special steel and metal alloys. The president of Aerea, Mr Luciano Zanotti, explains: "This center will focus its activity on those compounds scheduled by the European research program, Eureka. I am referring to materials made of glass, kevlar and carbon fibers, ceramics, and new titanium, zirconium, lithium and aluminum alloys. Approximately 100 researchers will be employed full-time at the Apulian center, but its activity will have a positive effect on the whole of Italy, particularly Lombardy. [Excerpt] [Rome LA REPUBBLICA in Italian 22 May 86 p 29] 8606/12948

CSO: 3698/M158

WEST EUROPE/AEROSPACE

BRIEFS

AEROSPATIALE BUILDING SATELLITES--The consortium led by Aerospatiale has been chosen by the organization for satellite telecommunications, Eutelsat, to supply its next three satellites with an option for five more. Aerospatiale obtained the Fr 1.5 billion contract after tough competition with another consortium led by Matra, which had already supplied the first four ECS's [European Communication Satellites]. As the prime contractor for these second-generation satellites, Aerospatiale is associated with Alcatel-Espace and with five other European companies: Marconi (UK), MBB [Messerschmitt-Boelkow-Blohm]-ERNO [Northern Development Area] (FRG), Aeritalia (Italy), Ericsson (Sweden), and ETCA [Space Technology and Constructions Studies] (Belgium). The first launching by either Ariane or by the shuttle will take place in 1989. [Text] [Paris L'USINE NOUVELLE in French 24 Apr 86 p 43] 25004/9835

CSO: 3698/A127

WEST EUROPE/BIOTECHNOLOGY

BRIEFS

FINLAND'S FIRST BIOCENTER ESTABLISHED--Our country's first research center for biotechnology will be established within the University of Oulu. The university board of directors made a decision on the issue on Thursday. The research center, which has been given the name Biocenter, will aim at developing and expanding the existing research in biotechnology. Research Professor Reijo Vihko from the department of clinical chemistry considers the decision significant. "Until now, it has not always been possible to fund a research project, since the research units operate independently and there has been no coordinating unit. Now the possibilities to obtain external financing, e.g. from industry, are considerably better," says Vihko. It is expected that the operation of the research center will be mainly financed with external funds. Vihko believes that the Biocenter will be particularly useful to the economy. "Examples of practical applications are various serums and vaccines, plant genetic engineering, biological purification of waste water, and the development of new species of plants and new breeds of animals. In the future, biotechnology will alter our living conditions, just as microelectronics has done within the past 20 years," predicts Vihko. It is hoped that the research center will put an end to the loss of qualified scientists to Helsinki and abroad. Up until now, a considerable number of scientists have left for the south, because northern Finland has not been able to provide them with work appropriate for their education. Biocenter will begin its operation at the end of this year. The necessary space for the research center will be provided by the university. [Text] [Helsinki HELSINGIN SANOMAT in Finnish 20 Jun 86 p 7]
12956

CSO: 3698/512

WEST EUROPE/DEFENSE INDUSTRIES

FRENCH MATRA, AEROSPATIALE DEVELOPING SATELLITE RECON SYSTEM

Paris L'USINE NOUVELLE in French 27 Mar 86 pp 40-41

[Article by Jean-Pierre Casamayou: "Helios Comes Out of the Shade"; first paragraph is L'USINE NOUVELLE introduction]

[Text] Aerospatiale and Matra are the major beneficiaries of the Helios military space reconnaissance program which consists of four satellites and a very large "ground component."

Andre Giraud, the minister of defense, should not question the Helios military observation satellite program as there is a glaring need for a space reconnaissance system. As of this year, Fr 125 million will be spent to close the first deals. However, the French space industry will receive a total of Fr 6 billion by 1992, the launch date of the first satellite which is to be followed by three more.

Picking up where the 1977 Samro optical reconnaissance satellite project left off, this program is conducted under the auspices of the Missiles Directorate (DEN) of the General Armaments Delegation. "It benefits from the Spot system's technology, but its performance is much better in the number and in the resolution of images, as well as in the satellite's mobility in orbit," confides Daniel Pichoud, director of the Helios program at the DEN. "Furthermore, all the prime contractors are manufacturers."

Among these manufacturers, the major beneficiary is Aerospatiale, which will receive the lion's share as the industrial architect of the system, consisting of a space-and a ground-based component. Aerospatiale will benefit even more as the prime industrial contractor for the "ground component." This will be operated by the military and consists of three specialized centers to be built in the Paris region: an operations center, an image reception center, whose joint operators have yet to be chosen (STAREC [Technical Company for Electronic Research and Applications], Elecma, and Telspace are all competing), and a center for image processing and interpretation, whose development has been entrusted to SEP [European Propulsion Company] and Matra.

The heart of the system is of course the satellite itself whose prime industrial contractor will be Matra Espace. Helios has a mass of 2,200 kg

and will use the Spot platform developed by Matra. It has one photographic telescope whose manufacture was entrusted to the Cannes Aerospatiale center. This telescope integrates optical components built by REOSC and CCD [charge-coupled device] focal plane sensors from SODERN [Corporation for Nuclear Research and Development].

As for Crouzet and Enertec, they have already developed prototypes of the two high-capacity magnetic recorders. Photographic transmission will be encrypted (undoubtedly by Thomson-CSF), as will image telemetry and remote control which are to be supplied by Alcatel Espace. To avoid duplication of effort, the CNES [National Center for Space Studies] control center will supervise technical launching operations and orbital control. To this end, SAT [Telecommunications Corporation] Control is to build an additional installation in Toulouse.

25044/9835
CSO: 3698/A120

WEST EUROPE/DEFENSE INDUSTRIES

BRIEFS

THOMSON-CSF BUILDING RADAR--France, the UK, and the FRG have decided to acquire a new anti-artillery radar, the "Cobra," which should become operational in 1922. Three teams composed of manufacturers from the three countries are competing to build this radar, development of which will begin next year. Thomson-CSF [General Company for Wireless Telegraphy], which has different departments assigned to each team, is already guaranteed not to lose the competition. The others will know the outcome at the end of the year. [Text] [Paris L'USINE NOUVELLE in French 27 Mar 86 p 37] 25044/9835

CSO: 3698/A120

WEST EUROPE/MICROELECTRONICS

FRANCE'S THOMSON CREATES CUSTOM SEMICONDUCTOR DIVISION

Paris L'USINE NOUVELLE in French 3 Apr 86 p 38

[Article by Claude Amalric: "Thomson Reorganizing Its Forces"; first paragraph is L'USINE NOUVELLE introduction]

[Text] Niches are currently up for grabs in the customized integrated circuit market which is expected to be enormous. Thomson is creating a division.

The creation of a "specific semiconductor services" (DS-3) division in Thomson's Components Branch comes at the right time: So far there have been no opportunities, and soon it will be too late to take a significant position in an already highly competitive market. That is particularly true in Europe which represents 19 percent of the integrated circuits world market but 24 percent of the specific circuits market, the latter being the most active segment of the whole with an annual growth rate of nearly 24 percent. Out of last year's $4.6-billion European total for these circuits, Thomson held a 3.7-percent share as did Plessey and National Semiconductor, behind LSI [Large Scale Integration] Logic (5.6 percent) and ahead of Marconi (3.1 percent), with which Thomson has concluded a second source agreement.

"These figures should be handled with caution," comments Jean Philippe Dauvin, economist of the Components Branch, who calculated them using the limited and varied data available. After all, the definition of specific circuit is not precise, and the share held by the large Japanese companies is unknown.

The fact remains that the opening of this new and seemingly simple market "is a trap for many small companies to fall into. They are being created to get a piece of this market without having the financial stability, technological support, and the sales network needed to fulfill their promises...," says Jacques Noels, chief executive officer of Thomson Semiconductors, who is determined to avoid this pitfall.

In fact, DS-3 will employ 400 people in Grenoble, the majority of whom are from the EFCIS [Company for the Study and Manufacturing of Special Integrated Circuits] unit. "There we have top-level expertise in large-scale integrated circuit design, and we are close to LETI [Laboratory for Electronics and Data Processing Technology], to CNET [National Center for Telecommunications Studies], and in the university circuit." In addition, we have the capacity for mass production.

Some 10 Specialized CAD Centers Planned in Europe

The sales network will be the 220 people marketing semiconductors. Some 10 specialized CAD centers are also planned in Europe. A total of Fr 600 million have been allocated to specific circuits, now united into a single division.

The objective is to go from 79 projects per year in 1985 to 1,600 projects in 1990. By that time, design should be reduced from 8 weeks to 1 week, and manufacturing from 8 weeks to...2 days! One can see the great strides which still need to be made on this last point, but the competition is hardly moving any faster--if at all.

25026/9835
CSO: 3698/A121

WESTERN EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

FRENCH INRIA'S ROLE IN ESPRIT R&D EXPLAINED

Paris ZERO UN INFORMATIQUE in French 17 Mar 86 p 70

[Article by Nicolas Rousseaux: "Research Has No Borders"; first paragraph is ZERO UN INFORMATIQUE HEBDO introduction]

[Text] Thanks to EEC projects, increasingly more research is being carried out by industrialists, not just French but European. INRIA is a good illustration of this new trend.

The National Institute for Research on Data Processing and Automation (INRIA) has been participating in the European ESPRIT project since the pilot stage in 1983. It has not been easy because in European political matters it is most desirable to know the political ins and outs in Brussels. Small organizations, small- and medium-sized enterprises or research institutes, being very ill-informed, are at a disadvantage. To respond to a bid invitation it is necessary to be informed as soon as possible, at least 6 months before the deadline, because bid invitations are usually only officially published 2 months before the deadline for applications.

To simplify the procedure the French government has loaned three officials from the Ministry of Research, from the PTT [Post, Telephone, and Telegraph], and from DIELI [Directorate of Electronics and Data Processing Industries]. They make up the "French strategic ESPRIT committee: in the Belgian capital. In a way it is an intermediary committee with an informal but decisive role.

An engineer (a polytechnical graduate from ENST [National Academy for Telecommunications]) working at the Rocquencourt center has been assigned almost full-time to monitor the proposals and bid invitations. Presently assigned to project implementation and industrial relations at INRIA, Patrick Rambert thus supervises contacts between INRIA and European industrialists, and he travels regularly to Brussels: "We are currently involved in 13 projects out of 20 initial proposals. Three motives can be found for our participation. ESPRIT has forced industrialists to increase their upstream research and us to come further downstream toward the market; hence, a large number of possible pairings."

"The second motivation, more down-to-earth, is that ESPRIT is also a source of fresh money coming at the right time. Finally, we must collaborate with foreign industrialists and this makes data processing frontiers even more intangible.

In 1986 INRIA will dedicate a total of 30 man-years to 13 ESPRIT projects (5 in advanced data processing, 3 in software technology, 3 in office automation, 1 in computer-aided manufacturing, and 1 in the IES [Information Exchange System] infrastructure program. The institute is a cocontractor for 7 of them and a subcontractor for the others. This represents a total annual budget of Fr 21 million (i.e., a little less than 10 percent of the INRIA budget), 50 percent of which is the EEC's responsiblity.

The partners are numerous. In France, Bull, Thomson-CSF [General Company for Wireless Telegraphy], CGE [General Electric Company], SEMS, Cap Gemini Sogeti, and SAGEM [Company for General Electricity and Mechanical Applications] can be mentioned. Abroad, approximately 20 industrialists are participating, including ICL [International Computers Limited], GEC [General Electric Company], Siemens, Nixdorf, AEG [General Electric Company], Philips, Olivetti, ELSAG [San Giorgio Electronics], CRAI [United Commission Agencies for Alta Italia], CSELT [Telecommunications Study Center and Laboratories], and also universities and research centers.

Although the projects have hardly started and certain contracts have not yet been signed, Partick Rambert is optimistic about the realization of this precompetitive EEC research: "The administrative burden of project management as well as the work of lawyers of the 12 large industrial groups who prepared the contracts have slowed things down. However, the worst is over . . . . Monthly work plans, subdivisions into research subgroups, monthly meetings, continuous electronic mail service, permanent negotiation partners . . . all exist now."

From April to July 1985 INRIA also participated as an expert in the development of EUREKA. The institute is participating in about a dozen advanced proposals, but in this case research does not have the initiative. It is industrialists who are seeking contacts (and it seems they are even coming from Germany to Rocquencourt . . .).

25031/13104
CSO: 3698/A105

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

FRENCH PRIVATIZATION PLANS, INVESTMENT CONTROLS

Paris L'USINE NOUVELLE in French 17 Apr 86 pp 61-62

[Article by Marie-Jeanne Pasquette: "Privatization: Directions for Use"]

[Excerpts] The principle of privatization is well-established. It will probably happen to at least one financial company before September (Paribas is in a good position) and to three industrial groups which could be the Compagnie Generale d'Electricite, Saint-Gobain, and Rhone-Poulenc in that order. The latter's president, Loik Le Floch-Prigent, has made no secret of favoring privatization, he has even estimated his company's value at Fr 12 billion.

Will the Paris Stock Exchange, whose capitalization is approaching Fr 950 billion, be able to mobilize the additional Fr 150 to Fr 200 billion needed to take over the nationalized companies from the state? It is, in fact, a question of finding Fr 20 to Fr 40 billion per annum for 5 years if the privatization program is fully implemented. These are minimum figures since they do not take into consideration the new appetite for stockholder funding which certain undercapitalized denationalized companies are sure to reveal. Compared with the volume of new share issues reported in 1985 (Fr 68 billion), the outlay required from investors is considerable. However, the government has planned certain measures which will be adopted before autumn and which will facilitate the issuance of shares on the market.

Technically, the denationalization process should sweep out of its way all the legal and fiscal obstacles it meets. But there are other problems. For instance, how to prevent foreign investors from taking control of French industrial groups? That is where the problem lies. Siemens, the European leader in electrical engineering, which is sitting on a cache of Fr 150 billion of stockholder's equity, is keeping a close eye on Thomson and CGE [General Electric Company], gropps whose activities complement those of the German firm to a certain extent. The government has been reassuring on this point.

In the RPR-UDF's [French governing coalition] plans, foreign groups were not to be allowed to acquire more than 20 percent of the capital of companies destined for denationalization. In theory, the goal seems easily attainable. But once in office, the departments working for Camille Cabana, the new minister for privatization, are realizing that this plan will

require implementation of efficient controls. Their studies seem to tend towards a legal device called "golden share" which would allow the arrival of foreign investors to be monitored. Thestate would keep at least one share of the company's capital and certain rights would be attached to this share for a period limited to a few years. In particular, it could refuse the transfer of certain assets or even choose the director's nationality. This formula, which comes from across the Channel (it is used by Jaguar and Cable & Wireless), does not of course stop the government from laying down rules on foreigners' access to privatizations, but above all, it gives it the means to ensure they are complied with.

Table 1. Ten Industrial Groups To Be Privatized

Group	Turnover	State share in capital (in %)	Profits 1985 (1)	Value of net assets end 1984 (1)	Estimate of the value of privatization (1)
Bull	16.1	95	+0.11	1.2	3.8
CGCT [General Company for Telephone Engineering]	2.8	100	-0.2	-	-
CGE	78.5	100	+1.0	7.0	10.8
Dassault	16.4	46	+0.43	2.8	14.5
Elf	180.7	67	+5.3	43.5	23.3
Matra	14.5	51	+0.07	1.7	3.3
Pechiney	36.0	82	+0.75	8.4	4.0
Rhone-Poulenc	56.1	91	+2.3	9.9	19.8
Saint-Gobain	66.7	100	+0.75	10.8	11.8
Thomson	59.0	100	+0.45	2.8	9.9

(1) In billions of francs

What is the value of the industrial groups which will be returned to the private sector in the next 5 years? The value of the net assets based on the results of the 1984 fiscal year, indicated in the above table, gives an initial assessment. But it is insufficient. Another evaluation method was used. For companies quoted on the stock exchange (Matra, Dassault, Elf), the stock market quotation of the share multiplied by the total number of the company's shares gives an estimate of the privatization value. In the case of CGE, the value of the 1985 profit multiplied by the PER (Footnote 1) (PER: Price Earning Ratio, i.e., the value of the company's shares estimated at the day's quotation divided by the latest known profit of Siemens)--the

leading European company active in the same sector and therefore comparable--gives a satisfactory approximation. For Bull, the same calculation was made with Nixdorf's PER. The value of the other groups was calculated by taking their net 1985 profit multiplied by the average PER in their sector as quoted in LE NOUVEL ECONOMISTE of 25 March 1986.

25042/9835
CSO: 3698/A123

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

ITALIAN GOVERNMENT PUBLISHES FINANCING FOR RESEARCH PROJECTS

/Editorial Report/ Rome GAZZETTA UFFICIALE DELLA REPUBBLICA ITALIANA in Italian No 77, on 3 April 1986, publishes a resolution adopted on 3 April 1986 by the Minister for the Coordination of Initiatives for Scientific and Technological Research for which special funds have been granted as provided by law and according to the arrangements for each project as listed below:

Caliberg S.R.L., Curno /Bergamo/ /large firm classification/.
Place of research: northern Italy.
Object of research: CAD/CAM system for the designing and manufacturing of molds.
Form of financing: Credit availability: 768 million lire, not exceeding in any case 50 percent of the allowed costs.
Contribution to the cost: 307 million lire, not exceeding in any case 20 percent of the allowed costs.
Duration: 7 years' amortization plus the period of research which must not exceed the term of 4 years.
Amortization: 14 semestral, constant, and deferred installments inclusive of capital and interests, starting from not later than the second semestral expiration date following the actual ending date of the research.
Starting date of the research: 1 January 1985.
Particular terms: Firm guaranty of Andrea Maggi and Carlo Reggiani SpA, Milan; acquisition, before the drawing up of the contract, of a 700 million lire loan for a term not shorter than 5 years at a favorable date.

Italtel Societa' Italiana Telecommunicazioni SpA, Milan /large firm classification/.
Place of research: northern Italy.
Object of research: mobile radio systems for private channels.
Form of financing: Credit availability at the annual rate of interest provided by decree of the minister of the treasury; contribution to the cost.
Maximum amount: Credit availability: 1,295 million lire, not exceeding in any case 35 percent of half the allowed costs /7,404 million lire/; contribution to the cost: 1,295 million lire, not exceeding in any case 35 percent of half the allowed costs /7,404 million lire/.
Duration: 8 years' amortization plus the period of research which must not exceed the term of 6 years.
Amortization: 16 semiannual, constant, and deferred installments inclusive of principal and interests, starting from not later than the second semestral expiration date following the actual ending date of the research.
Starting date of the research: 1 January 1982.

Ing C. Olivetti & SpA, Ivrea /Turin/--Tecsiel Tecnologie E Strumenti Per Sistemi Informativi Elettronica SpA, Naples /large firms classification/.
Place of research: northern and southern Italy.
Object of research: Multifunctional work stations based on artificial intelligence techniques.
Form of financing: Credit availability at the annual rate of interest provided by decree of the minister of the treasury; contribution to the cost.
Maximum amount: Credit availability: 6,863 million lire, not exceeding in any case 40 percent of half the allowed costs, part of the amount /2,087 million lire/ will be charged to the northern Italy contribution and the remaining 4,776 million lire, not exceeding in any case 40 percent of the allowed costs, will be charged to the southern Italy contribution. The total allowed costs amount to 10,435 million lire for North Italy and 11,942 million lire for southern Italy; contribution to the cost: 6,863 million lire, not exceeding in any case 40 percent of half the allowed costs, part of the amount /2,087 million lire/ will be charged to the northern Italy contribution and the remaining 4,776 million lire, not exceeding in any case 40 percent of the allowed costs, will be charged to the southern Italy contribution. The total allowed costs amount to 10,435 million lire for northern Italy and 11,942 lire for southern Italy.
Duration: 8 years' amortization plus the period of research which must not exceed the term of 6 years.
Amortization: 16 semestral, constant, and deferred installments inclusive of capital and interests, starting from not later than the second semestral expiration date following the actual ending date of research.
Starting date of the research: 1 January 1986.

SNIA BPD SpA, Milan /large firm classification/.
Place of research: southern Italy.
Object of research: Launch vehicles and solid propellants.
Form of financing: Credit available at the annual rate of interest provided by decree of the minister of the treasury; contribution to the cost.
Maximum amount: Credit available: 10,082 million lire, not exceeding the cost: 10,082 million lire, not exceeding in any case 40 percent of the allowed costs.
Duration: 8 years' amortization plus the period of research which must not exceed the term of 5 years and 6 months.
Amortization: 16 semiannual, constant, and deferred installments inclusive of principal and interests, starting from not later than the second semestral expiration date following the actual ending date of the research.
Starting date of the research: 23 April 1985.

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CSO: 3698/M141

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

BRIEFS

ITALY FUNDS INDUSTRIAL PROJECTS--Rome. Minister of Research Granelli has approved the financing of 52 industrial research programs submitted by Italian companies at a total cost of 210 billion lire, which will be paid by the applied research fund. The following sums were allocated to these sectors, which are among the most important: electronics (75 billion lire), the pharmaceutical industry (58 billion lire), mechanics and electromechanics (25 billion lire), the aircraft industry (20 billion lire), the chemical industry (10 billion lire), the agricultural and food industry (8 billion lire), minor and sundry programs (14 billion lire). The funds allocated to companies operating in souther Italy amount to approximately 90 billion lire. The most significant programs include: optical fiber transmission components and systems and technological development in the area of telecommunications terminals; control center for a 200-channel VHF mobile-cell radio system, and state-of-the-art equipment for the rationalization of the production process and software maintenance. In addition, Granelli preselected 90 new programs of great scientific-technological interest for the new IMI investigation. Following the guidelines laid down some time ago by the ministry's Department of Research, an additional 200 billion lire were allocated to the programs designed for southern Italy. [Text] [Rome IL POPOLO in Italian 7 Jun 86 p 13] 8606/12948

CSO: 3698/M153

WEST EUROPE/TECHNOLOGY TRANSFER

COMMITTEE ON USSR, FINLAND COLLABORATION IN S&T, SPACE

Space Research: Phobos, Interball

Helsinki TIEDONANTAJA in Finnish 5 Jun 86 p 6

[Article: "Further Imports Sought. Finland and the Soviet Union to Enter Collaboration in Space"]

[Text] Possibilities for collaboration in space research will be studied in a temporary committee, which was appointed during the meeting on scientific-technological collaboration between Finland and the Soviet Union; the meeting ended in Helsinki on Wednesday.

Finland is currently involved, with several other countries, in two Soviet space research projects. Finland is supplying equipment for the Phobos probe, which will be launched in a few years to study Phobos, a moon of Mars. Finns are also involved in Interball-satellite, which will be launched into near space to do research on the northern lights, among other things.

The meeting heard the reports on collaboration in the field of natural and social sciences. Also, collaboration in chemistry and in the field of pulp and paper industries was discussed.

A decision was made concerning the transfer of issues concerning environmental protection and the pollution of the Gulf of Finland to the new commission of environmental collaboration between the countries.

Practical Results

The report of the meeting says that the work of the committees has produced practical results which are to the benefit of both countries. According to the report, in several areas of scientific-technological collaboration, opportunities have been created for the continuing development of commercial and economic relations between the countries.

The leader of the Finnish delegation was Pekka Jauho, director general of the State Technological Research Center, and the

leader of the Soviet delegation was A. K. Romanov, the vice chairman of the state committee on science and technology.

Further Exports Sought

A solution to the problems of deficit in the trade between Finland and the Soviet Union has been sought all week in the negotiations in Helsinki lead, on the Soviet Union's side, by N. N. Smeljakov, the country's vice minister of foreign trade.

The results of the meetings will possibly be reported on Friday. On Wednesday, however, Finnish authorities believed that the discussions will go on until Midsummer.

Boris Aristov, foreign trade minister of the Soviet Union, will visit Finland after Midsummer and the intention is to agree on the possibilities of further imports from the Soviet Union.

Already some further imports have been found, but the practical aspects still need to be worked out, say the Finns.

The Soviet Union has offered Finland almost 1.5 billion markkas' worth of additional imports this year. Objects for further imports which would suit both parties will be looked for in the discussions. Next year the need for additional imports is expected to grow to over 3.5 billion markkas.

Finland, High Tech Within COMECON

Helsinki TIEDONANTAJA in Finnish 5 Jun 86 p 6

[Article: " 'COMECON's Program Provides a Good Basis.' Finland Ready for Collaboration in High Technology"]

[Text] According to Jermu Laine, minister of foreign trade, the overall scientific-technological program of COMECON, the economic organization of the socialist countries, provides an excellent basis for preparation of new projects which also interests Finland. According to the minister, this work has already begun in the commission for collaboration between Finland and COMECON.

In his question to the Parliament, Ensio Laine, member of Parliament (comm.), had asked the cabinet to study Finland's possibilities of participating in the high-technology program of COMECON. In his reply, Minister Laine states that there are several concrete topics which are included in the scientific-technological overall program of the collaboration commission's agenda which are currently being studied.

As objects for collaboration, the minister of foreign trade listed such issues as production control systems, industrial robots, powder metallurgy, plasma coatings, explosive coatings, superconductivity, monoclonic antibodies, biology and microbiology, as well as laser technology and several objects of food industry.

The objects of collaboration will be discussed in this year's specialist meetings of the executive committees of the commission or in separate contract negotiations between the institutes and companies. According to Minister Laine, the specialists of Finnish companies and institutes have been very interested in the discussions of these new scientific-technological subjects.

Decision on Program in 1984

The decision on COMECON's scientific-technological overall program was made at the summit of the party leaders of the organizations's member countries in 1984. The purpose of the program is to accelerate the economic development and modernization process of the socialist countries. The program extends until the year 2000. The program was signed at the meeting of the prime ministers of the COMECON countries in Moscow in December 1985.

The scientific-technological overall program includes almost one hundred research areas and the program will be implemented with the help of multilateral or bilateral agreements between the COMECON member countries. The program, in which also countries outside COMECON can participate, is specified and developed in parallel with the five-year coordination plans.

12956
CSO: 3698/512

EAST EUROPE/BIOTECHNOLOGY

ROLE OF HUNGARIAN ACADEMY OF SCIENCE IN DEVELOPMENT OF BIOTECHNOLOGY

Budapest AKADEMIAI KOZLONY in Hungarian No 4, 23 Apr 86 pp 86-88

[Resolution No 6/1986 of the Hungarian Academy of Sciences Presidium, adopted at the Presidium's 28 January 1986 session, approving the Report on the Tasks of the Hungarian Academy of Sciences in the Domestic Development of Biotechnology]

[Excerpts] The chairman of the ad hoc committee appointed pursuant to Resolution No 40/1985 submitted an informative report entitled "The Tasks of the MTA [Hungarian Academy of Sciences] in the Domestic Development of Biotechnology."

The Presidium essentially concurred with the substance of the report. There were comments only on two of its aspects. Some members of the Presidium objected to the report's omitting the problems of marketing. Others pointed out that proper emphasis was lacking on the task of educating and training specialists.

The ad hoc committee's chairman who presented the report answered the comments. Taking cognizance of his answer, the Presidium approved the ad hoc committee's report.

On the basis of its report, the findings of the ad hoc committee formed pursuant to Resolution No 40/1985 may be summed up as follows:

1. The bioindustries can be expected to produce competitive new products when the entire innovation chain is in place that extends from basic research through development to the design of new technologies.

The Academy's primary task in this field is to promote basic research of a high level. This research will require financial support from the [Academy's] central research fund, as well as from the [OKKFT (National Medium-Range R&D Plan)] Program of Basic Research in Biology which bears the prefix Tt [Natural Sciences], and from the National Long-Range Research Fund. Purposeful basic research to support biotechnology could boost innovation especially in those areas within the economy that have attained a traditionally high level and are playing an important role in our export, such as agriculture, the food industry or the pharmaceutical industry; and within society, in such areas of fundamental importance as health care or environmental protection.

Within the framework of the OKKFT Program of Basic Research in Biology bearing the prefix Tt, the Academy will support and coordinate basic research in molecular genetics and molecular biology at the cellular and organism levels. But the Academy will have to support also the research which seeks answers to questions that are basically new in the production process or have not been solved as yet in Hungary.

An important task to this end is the mathematical modeling of fermenters and biological systems, the construction of models for the optimization and control of the processes. It is essential to design and implement microprocessor-controlled fermentation systems that meet the standards of modern technology. The study of the production and use of immobilized enzymes and cells, the investigation of the downstream operations, and the application of biosensors and semiconductors in the fermentation processes are already widespread in industry. The measuring techniques of tissue culture, its mathematical modeling and the elaboration of its control strategy are likewise essential tasks awaiting solution.

2. Through the pooling of financial resources, it is necessary to support the basic research whose objectives are already clear, and within the framework of which the investigation of foreign discoveries in other, new areas is desirable, and the domestic introduction of the discoveries and adoption of the techniques are essential to further progress. [Economic] program G-3 [Research and Development of Biotechnological Processes, and Their Application in Industry and Agriculture] is also intended to support such research, but the specific situation in this branch of science requires that this research be the responsibility of the Academy's Tt [Natural Sciences] program.

Discoveries in molecular genetics and biochemistry ushered in the era of new biotechnology, and the spreading and adoption of new mentality and techniques in our country encounter bottlenecks primarily in these fields.

The staff of experts in the physiology and biochemistry of the microorganisms used in production practice ought to be increased by an order of magnitude. A prerequisite for the successful widespread use of genetic engineering is knowledge of where, in which stage, to influence the metabolic processes.

Basic research that investigates the organisms utilized in production practice should likewise receive pooled support, if the researchers' professional qualifications are a guaranty of success.

3. Because of the foreseeably rapid development of biotechnology, smooth practical application of the domestic results in basic research is especially important. It should be enhanced also with incentives for the researchers participating in this basic research.

It is in the primary interest of the Hungarian economy to provide the conditions necessary for the practical application of the research results. The absence of a transition from laboratory research to full-scale production is hampering and even preventing the practical application of the results of basic research. The lack of an R&D base for pilot-plant testing and scale-up is the "bottleneck" of the biotechnological, industrial and agricultural programs'

successful implementation. Therefore the establishment of a suitably flexible R&D unit, with incentives linked to the innovation processes, seems warranted.

To aid applied industrial biotechnology research and scale-up, a separate biotechnological development laboratory must be established whenever the conditions are ripe for making such a product, for its industrial production.

A national problem is our failure so far to develop a staff of experts who, as applied researchers, utilize the results in basic research. Therefore the basic-research teams have been, and will be, forced to undertake this task as well. It must be understood that the applied-research staff to be formed will have to be larger than what strictly interpreted basic research will require; and that the professional qualifications of the applied-research staff cannot be much lower than in basic research, because otherwise this staff would be unable to cope with the scientific problems that arise in the course of practical application. Nationally coordinated planning of graduate and postgraduate training is indispensable to supplying specialists for the industrial and agricultural applied-research and development bases that are to be established.

4. It is the task of the Academy to ensure our continuous presence in the "international mainstream" of biotechnology research. For us it is essential to constantly maintain close contact with the research centers of the countries that are years ahead of us. The industrial researchers' scope of action is limited both at home and in the host country, even when certain researchers are internationally renowned. It is a decisive task of Academy research to fight continuously and purposefully against isolation.

Even in scientific relations, a partnership of equals can arise only if there is constant dialogue, and if the knowledge of one partner is comparable in value to that of the other. Primarily the Hungarian Academy of Sciences must provide the conditions, the "bridge," for the intensive exchange of information, and for active participation in the life of the international scientific community.

5. The tasks of the Hungarian Academy of Sciences include reporting on the proposals to provide the financing necessary for the domestic biotechnological innovation chain. Relying on the professional knowledge of its wide network of scientific collegiums, and cooperating extensively with the other central agencies, the Academy can express its opinion in the coordination of financing.

6. The domestic development of biotechnology, the planned central program of economic development, and the implementation of the recently decided CEMA cooperation warrant that an agency with broad authority combine all areas of domestic development. Fruitful relations could be established between such an agency and the council of the (Tt) Program of Basic Research in Biology.

1014
CSO: 2502/41

EAST EUROPE/BIOTECHNOLOGY

HUNGARIAN ACADEMY'S CONTINUING ROLE IN DEVELOPMENT OF BIOTECHNOLOGY

Budapest MAGYAR TUDOMANY in Hungarian No 4, Apr 86 pp 315-317

[Article by R.R.: "Academy's Task in Development of Biotechnology on Presidium's Agenda"]

[Excerpts] At its January 1986 session, the MTA [Hungarian Academy of Sciences] discussed the first draft of the proposal to amend the Academy's by-laws. The members of the Presidium considered and commented on the general elements and policy principles of the changes. It will be the task of the Academy's 1986 general assembly to decide what modifications, respectively what recommendations, the Academy will submit to the government in conjunction with the Academy's by-laws.

The Presidium approved the informative report "The Tasks of the MTA in the Domestic Development of Biotechnology" prepared by the ad hoc committee that had been formed pursuant to the Presidium's Resolution No 40/1985. In view of the timeliness and importance of this topic, and also in compliance with the wishes of several Presidium members, we are reviewing the report even though the Presidium has not debated its content.

The Academy--at the government's request and with the participation of representatives from the ministries concerned--drafted already in 1982 a proposal spelling out the conditions for the application of biotechnology. These conditions embrace the entire innovation chain, beginning with basic research. The proposal played a major role in the formulation of a domestic biotechnology program whose implementation, as a part of the National Medium-Range R&D Plan (OKKFT), will continue also under the coming 7th Five-Year Plan.

A specific task of the Academy under the five-year plan ending in 1985 was the continuation of basic research providing the underpinnings of the biotechnologies of the future. To this end the Academy integrated the various research centers' activities in the OTTKT [National Long-Range Scientific Research Plan's] principal direction entitled "The Mechanism of Regulating Vital Processes (Bioregulation)," and in certain directions of basic research included in the KKP [Central Research Program]. The Academy also exerted a guiding influence on the planning of research in molecular biology. The results of the basic research financed in part also by the OMFB [National Technical Development Commission], in addition to Academy financing, serve as the underpinnings of the present biotechnology R&D program's modern research directions.

The first results of domestic biotechnology research were produced in the second half of the 1970's. Hungarian researchers were the ones who developed bacterial and fungal protoplast fusion, and they were among the first to describe mutants in cultured plant cells. Very quickly and conforming to high standards, they adapted gene-splicing and the techniques of DNA chemical synthesis, DNA sequence determination, and monoclonal antibody production. They were in the forefront of phythosomatic cellular genetics and also characterized new restriction enzymes. The commendable results in the mathematical modeling, optimization and computer control of fermentation processes, and in enzyme engineering, were achieved with the help of work groups. While promising schools were emerging in basic as well as applied research in this essentially new stage in the development of the biological sciences, in Hungary--in contrast with the world trends--the support of basic research declined in both absolute and relative terms. Due to the paucity of resources, scientific manpower was not transferred to basic research supporting biotechnology; the increase in the number of research centers and researchers employing the new techniques was inadequate; and neither the ingenuity nor the diligence of the researchers was able to offset the backwardness of the infrastructure of research and the difficulties that foreign-exchange restrictions created in procurement.

Despite the worsening conditions, the ministry-level biotechnology program administered by the Academy produced some favorable results. It promoted the spreading of the most important techniques in Hungary, their inclusion in the university curricula, and their introduction in the operations of the Hungarian pharmaceutical factories.

In outlining biotechnology development in Hungary, the members of the ad hoc committee proceeded from the realization that a small country cannot play a significant role in every branch of basic research underlying biotechnology. The support is warranted of those directions of basic research which have recognized domestic traditions, well-trained experts with suitable qualifications, and research teams and schools that meet international standards. Once we recognize that all the blank spots on the map of domestic research cannot be filled in, it is warranted to set central preferences for the research essential to underpinning the long-range objectives in industry, agriculture, health care, environmental protection, and the long-range development of the national economy. At present, the absence or obsoleteness of several directions of basic research in Hungary is hampering biotechnology development.

According to the report, a domestic research base must be established for several new fields of research. Many of the prerequisites exist for the designing of proteins (enzymes). However, the investigation of protein structures by x-ray diffraction is lacking completely, and consideration ought to be given to establishing international collaboration for this purpose.

A laboratory complex for microchemical analysis and synthesis is indispensable for genetic engineering research that requires a comprehensive stock of instruments for determining the microstructures of proteins and DNA, ranging from DNA synthesizers to computers.

Although biotechnology covers a much broader scientific field than genetic engineering, the latter is the most prominent part of biotechnology. For the

practical application of genetic engineering we must know the living organisms which we wish to modify in accordance with our objectives. To this end it is necessary to emphatically support research of the microorganisms, plants and animal species that have practical applications in agriculture or industry.

Small teams of gifted researchers engaged in basic research deserve increased attention. It would be desirable to have such teams, for example, in experimental embryology, and in research of receptors, membranes, metabolic regulation, regulation of cell division, and oncogenic viruses. For these are indeed the directions of basic research in which the most significant discoveries and breakthroughs can be expected, although the advances within them cannot be predicted beforehand.

The report's supplement is a summary of the findings in the debate before the Department of Biological Sciences. Thus the bioindustries can be expected to produce competitive new products when the entire innovation chain is in place that extends from basic research through development to the design of new technologies. The Academy can do much by coordinating the Program of Basic Research in Biology, but it will be necessary to support also the research that seeks answers to questions that are basically new in the production process or have not been solved as yet in Hungary.

In the department's opinion, it is essential to design and implement microprocessor-controlled fermentation systems that meet the standards of modern technology, and to elaborate the measuring techniques, mathematical modeling and control strategy of tissue culture.

Through the pooling of financial resources, it is necessary to support the basic research whose objectives are already clear: for example, the domestic introduction of foreign discoveries, or the establishment of conditions conducive to the rapid realization of objectives judged as promising in the international literature.

Discoveries in molecular genetics and biochemistry ushered in the era of new biotechnology, and the new mentality has helped to spread the techniques. In Hungary there are bottlenecks primarily in these fields.

Incentives for the researchers are a prerequisite for the quick and smooth practical application of the domestic results of basic research. Incentives are important also because it is in the primary interest of the Hungarian economy to provide the conditions necessary for the practical application of research results. The absence of a transition from laboratory research to full-scale production is preventing at present the practical implementation of the results in basic research. A network of suitably flexible development units, with incentives linked to the innovation processes, ought to be created as soon as possible. And also a staff of specialists able to apply the results of basic research.

It is the task of the Academy to ensure our continuous presence in the international mainstream of biotechnology research, and to maintain close contact with the research centers of the countries that are years ahead of us. The tasks of the Academy include, among other things, reporting on the proposals to provide

the financing necessary for the domestic biotechnological innovation chain, consulting the Academy's network of scientific collegiums and utilizing their professional knowledge. Finally, in the department's opinion, the establishment would be warranted of an agency with broad authority to combine all areas of domestic development, in close cooperation with the council of the Program of Basic Research in Biology.

1014
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EAST EUROPE/BIOTECHNOLOGY

JUVENILE DIABETES CURED BY CELL TRANSPLANT PROCEDURE

Budapest MAGYAR NEMZET in Hungarian 12 May 86 p 6

[Text] Juvenile diabetes has become more frequent in many countries including Hungary. It often happens that by the age of 20 years diabetes impairs vision, or in some cases causes blindness. At the last Congress of the Hungarian Diabetes Association the report that a procedure of treatment to help juvenile diabetes patients has been worked out at Szeged caused a scientific sensation. We asked Dr Sandor Karacsonyi, university professor and director of the Szeged Surgical Clinic, questions about the details.

Pancreas Transplant

[Question] On the case-sheet of diseases where does juvenile diabetes stand?

[Answer] The scientific community is making a great world-wide effort for the treatment of juvenile diabetes. The problem is that diabetes is difficult to treat with insulin at an early age. While in the case of adults it is relatively easy to influence the unbalanced metabolic process, the same is not true of juvenile diabetic patients. Their condition is complicated by the fact that the blood vessels show very early damage. We do not know the precise cause, but on assumption we believe that insulin treatment, or frequent blood sugar fluctuation, plays a role in the damage of the vessels in the retina and the kidneys.

[Question] How can this be guarded against?

[Answer] Thus far research indicates that the elimination of blood vessel damage can be expected primarily from a transplant of the pancreas. The American Professor Sutherland and medical research teams in several West European clinics are in the vanguard of these endeavors. For now, however, the shortage of organs sets limits to transplants: appropriate donors and the immunological base are lacking.

[Question] Have other procedures been worked out to solve the problem?

[Answer] Sutherland and the research teams at the Munich clinic are expecting results from the transplant of island cells. As is known, the Islands of Langerhans cells in the pancreas produce insulin, and this is the matter that

regulates the blood sugar level of the organism. Well, the transplant of island cells appears to be an extremely ingenious process with a smaller risk than in the case of pancreas transplants. But after the initial expectations it became evident that the island cells are also sensitive to immunological changes. The partitioning of island cells is a problem, for if it is done with inappropriate techniques and enzymes, the cells may perish following the partition.

A Declining Insulin Requirement

[Question] The Szeged Surgical Clinic has taken up the solution of this scientific riddle in an original way. Under your leadership, a unique surgical procedure has been found as a result of experimentation and it has been introduced in Hungary.

[Answer] Dr Gyula Farkas, one of our talented researchers, has worked out on the basis of experiences gleaned from the literature an independent isolation method for partitioning the island cell. Since our goal was the clinical realization of the island-cell transplant, we took the cells from the pancreas of a fetus--which means a 22 to 32 week old embryo. The embryos perished at an extremely early stage, or because of sickness were given birth prematurely by means of surgery. At the moment of birth the pancreas was removed, and we separated from it the island cells, which we kept for 10 weeks in an incubator with a temperature like that of the human body and observed the volume of their insulin production. We surgically introduced into the body of the juvenile diabetic patient the cells which were prepared in this way and which multiplied during the preparation process. We performed a tissue classification on the embryo and the patient before the surgery. The cell was transplanted into the left lobe of the liver by way of the patient's umbilical vein which was first dilated.

[Question] How many transplants like this have taken place, and what changes occurred in the patient's condition?

[Answer] We performed seven cell transplants, four on young women and three on men. In all of them the insulin requirement declined, in four it dropped by 50 percent. That the carbohydrate metabolism does not adjust itself fully in this process, that is, the external insulin requirement is not eliminated, is explained by the following. Few cells can be obtained from an embryo and these are not enough for an adult male. Another problem is that in this form of cell transplant, too, the danger of rejection exists.

The main verified result of the Szeged procedure up to now has been the defense against blood vessel damage. To our knowledge, without a pancreas transplant this is the only way that the damage can be checked in young patients. We started the experiments 3 years ago, and the juveniles who were operated on improved visibly. The eye examinations, of course, were done by physicians who were not members of the transplant team. That the cell transplant is not accompanied by complications is also encouraging.

[Question] Is your work a world sensation or "only" a domestic scientific discovery?

[Answer] The news about the surgical procedure has been reported only in the professional literature. But international interest in the surgical technique worked out experimentally at Szeged has been very great. Representatives of our clinic are being invited to all congresses held abroad where the subject of juvenile diabetes will come up. It should be noted that the idea of an island-cell transplant first came up in Hungary at the Number I Budapest Surgical Clinic, where they carried out valuable work to assure immunity to the cells under preparation for a transplant. Cellular defense against rejection is an extremely ingenious method, and it is possible that this procedure will make it unnecessary to use drugs for its prevention. But cell transplants have been conducted on humans in Hungary only at Szeged. From the viewpoint of the future, it is very important to what point of time and for how long the transplanted cell will exert its therapeutical activity. Since we started the research at Szeged only 3 years ago, we can hardly give a definitive answer to this question.

International Interest

[Question] Is the problem of juvenile diabetes solved at a stroke with the operations?

[Answer] The true solution would be pancreas transplant, which is, however, an extremely expensive and complicated procedure. There has been no pancreas transplant in Hungary as yet. But until pancreas transplants are widespread--this will apparently take a year or two--we can use cell transplants. I emphasize once again that with the surgery we can have a favorable effect on blood vessel damage in juvenile diabetes, which may cause blindness by the age of 22 or 23 years.

We have very good relations with the Clinic for Internal Diseases from where we receive an increasing number of patients. We should like to establish still closer relations with the Children's Hospital in Szeged in order to begin treatment at the earliest possible stage.

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EAST EUROPE/CHEMICALS-PHARMACEUTICALS

PRODUCTS, ACHIEVEMENTS OF PCK SCHWEDT PLANT (GDR)

Leipzig CHEMISCHE TECHNIK in German No 4, Apr 86 pp 137-138

[Text] The primary task of the PCK ["Petrolchemisches Kombinat Schwedt"] consists of constantly ensuring that the steadily growing need of the national economy is met for fuels, lubricants, aromatics, petrochemical and inorganic products, as well as for high quality consumer goods, while at the same time seeing to it that growing export tasks are also carried out.

The period of the Five Year Plan 1981-1985 was characterized by a transition in the reproduction process to comprehensive intensification. The concrete expression of this intensification in the processes of crude oil refining and petrochemistry is the higher level of refining of the shrinking quantity of the raw material crude oil and its present level at approximately 17 million tons/year for the national economy of the GDR, as well as a more comprehensive utilization of increasing quantities of tars and tar oils as byproducts of lignite processing in the area of inorganic chemistry.

Improved Refining of Crude Oil

With the planned establishment of the cracking and aromatics unit as well as of a visbreaker in Schwedt, the production of light products (e.g. VK, DK, aromatics, propenes) was increased from 47 to 62 percent. Significant quantities of aromatics were made available for export. A significant step was the substitution that was carried out throughout the entire national economy of the GDR of heating oil for the generation of heat and electrical energy by domestic fuels as one of the prerequisites for ensuring the availability of raw materials in the cracking process of crude oil refining. Since the need for "light products," particularly for gasoline, will continue to grow, we at PCK are presently realizing the redesign of the FCC unit to approximately 150 percent of original capacity and the expansion of the vacuum distillation unit by almost 40 percent to ensure the raw material basis for this in Schwedt, as well as the increase in DK production at the "Hydrierwerk" combine enterprise in Zeitz.

Petrochemistry

In all plants which produce petrochemical products, it was possible to achieve significant increases in capacity beyond projected indicators. A few examples:

acrylonitrile	175%
terephthalic acid	112%
calcium ammonium saltpeter	109%
n-paraffins	141%
p-xylene	138%
O-xylene	316%

The production of acrylonitrile and terephthalic acid will be greatly increased again in 1986 within the framework of central national economic projects by means of the redesign or expansion of existing facilities. These two projects in particular will have a major impact on the securing of raw materials for the textile industry of the GDR.

A typical indication of the new stage of intensification is evident in the series of fiber projects: the actual impact will be felt above all in the overall framework of the national economy.

In the sector of olefin production, we are meeting the requirements of intensification by moving the palette of application products for pyrolysis consistently in the direction of products with higher boiling points.

Inorganic Chemistry

The main focus of our work concerns the expansion of production lines and processes for the treatment of domestic lignite tars and tar oils and other available coal tars for fuel, paraffins, aromatics, electrode coke, montan wax raffinates, electrode bonding agents and lubricants. The prerequisites are thereby created for the processing of the quantities of inorganic raw materials which are now being produced and which will be produced in greater quantities over the coming years. Basic research in the extraction of fuels from lignite is being carried out in a goal-oriented way.

Production of Consumer Goods

The PCK Schwedt, since 1984 in particular, has been meeting the need in a stepped-up way for more and qualitatively better consumer goods, i.e. products for the over-the-counter trade. With the realization in terms of research and investment of a production line for the manufacture of shoe-care and leather-care products in only 12 months as well as the production of two new household cleanser sprays each year in 1985 and 1986, the basis for a PCK product assortment was created which will be consistently expanded each year and which is able to meet the needs of modern consumers. This is an effective supplement to the previous product assortment of solvents, building protective agents, candles, floor-care and auto-care products.

Research and Development

The selected results and the increased performance of the PCK Schwedt which have been discussed here have been greatly influenced by results of PCK's own research and by cooperation with the Academy of Sciences of the GDR, the Karl Marx University in Leipzig, the Ernst Moritz Arndt University in Greifswald, the Carl Schorlemmer Technical University in Leuna-Merseburg, but also by the VEB Walter Ulbricht combine in Leuna.

Our PCK research was not only measurable in economic terms and effective within the framework of intensification, but also resulted in procedures and processes which were realized already under license on a large scale in an international framework. This includes the process for the manufacture of cyannatrium in India, selective C_2 hydrogenation in the FRG, the aromatics technology in Hungary, just to name a few examples. The DESUS hydro-refining technology was twice installed in Schwedt by the Toyo Engineering Corporation of Japan and is now integrated into the high conversion soaker cracking unit of TEC. This HSC-DESUS technology represents one of the alternatives on an international scale to the complete reprocessing of crude oil residues.

12792
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EAST EUROPE/COMPUTERS

STANDARDIZATION OF SOFTWARE, COMMENTARY ON RECENT GDR LAW

East Berlin STANDARDISIERUNG UND QUALITAET in German No 3, Apr 86 pp 88-89

[Text] The introduction of computer solutions as a unity between hardware and software in all phases of the reproduction process as well as in the non-producing sectors of the national economy is the visible expression of the increasing application of microelectronics as a key technology in our country. In this process, software is a decisive component for the niveau and use-value of all of the technical means, procedures and technologies in which computer technology, no matter of which generation and degree of refinement, is utilized.

With the multitude of various possible implementations and applications, especially in the creation of CAD/CAM and CAQ systems, flexible manufacturing segments requiring little attended operation, as well as for office and administrative tasks, the need for high-quality software is increasing. This need can only be met by a division of labor in which the hardware manufacturer and the user agree on software development and production as well as by a funddamental increase in multi-tasking possibilities. The principles underlying the work of standardization in the area of software are derived directly from this, which underscore with new emphasis several aspects of the standardization practice for products as it has existed to date.

Essential principles are:

--The formulation of standards must be closely linked to current hardware and software research and development work as well as to R&D which is planned to take place over the next few years and for the development of data banks and data networks. It must contribute to reaching the goals set forth for these areas in the Complex Program of Scientific-Technological Progress of the CEMA Member Countries to the Year 2000, by means of an accelerated development of CEMA and national standards as well as by a progressive introduction of advanced international standards.

--The efficient development and production of software based on a division of labor, the quality assurance and multi-tasking features of the software as well as the effective application of available software means and systems must be decisively influenced by a body of basic standards.

At the same time, domestic standards must be worked out, taking into consideration the responsibility established in the law concerning the planning, balancing and clearing of software (Footnote 1) (Regulation concerning the Planning, Balancing and Clearing of Software of 13 Jan 1986, Law Gazette 1, No 4 of 28 Jan 1986) and in keeping with the bilateral and multilateral agreements of international cooperation among the socialist countries, beginning with national planning and development of standards, must be included in the unification work with the USSR and other CEMA states.

--In the industrial sectors, standardization work must be carried out in close cooperation with the colleges and universities, the Academy of Sciences, as well as the ASMW, for the sectorally unified development of applications software and for the development and design of product data bases (creation of reference solutions) as well as of effective software tools.

--The effective introduction of CAD/CAM and other computer-enhanced systems as well as the related integration taking place between processes of development, design, planning, manufacturing, quality control and materials management require structuring in the areas of hardware technology, information technology and program technology. It is useful to undertake a division into task and application-dependent and task and application-independent modules. The interfaces which thereby result must be standardized.

Computer-assisted design has as a prerequisite the creation of computer-internal models of objects and the generation of the graphic representations which are necessary for visualization (graphics output), including the manufacturing drawings. This leads to the task of standardizing computer-internal representation of product data and to modelling methods as well as graphics software (Footnote 2) (A. Kotzauer: "Standardisierte Grafik-Software, edv-aspekte" 4 1985, p. 18) as a basic component in any CAD system.

--An essential basic element of CAD/CAM and other computer-assisted systems are the many kinds of information which are needed and which are stored in data bases. They include functional, geometric, technological, organizational and economic data which is subject to constant modification and which must be available at the same time to multiple users, also of different systems. For the data bases which must be developed for this, this results in several essential standardization tasks, which are supposed to ensure compatibility with systems that log on, the effective communication between them and rational organization of data.

In view of these principles and of the analysis of the level of standardization work both nationally and internationally, which is still unsatisfactory, the ASMW, in close cooperation with combines, scientific institutions and colleges, has developed a program for standardization in the area of software to the year 1990, which contains the following complex of themes:

--Bases for Communication, Technical Terms and Definitions

This complex of standards is to contain both fundamental concepts of information processing and special concepts of software development and applications, as well as quality control with regard to ISO 2382 and IEE [sic] 729.

--Graphics Software, Computer-Internal Representation

Within this complex, standards are to be formulated for the graphics core system (GKS), for two and three-dimensional modelling on the basis of ISO 7942 and ISO 8632, as well as for the representation of objects of any depth (GKS level 3) with the corresponding language integration. Also standards for the computer-internal representation of product data (RID) and the graphics described in [2] for data communication between graphics systems CGM (computer graphics metafile), as well as between graphics system and graphics computer CGI (computer graphics interface).

--Exchange of Data, Compilation of Data Bases and Computer Networks

With this complex, bases for the compilation and the operation of data banks, in particular the data base interface for 16 and 32 bit computers, a unified data base language as well as data structures and data models for the exchange of product data are to be standardized. With regard to the latter area, in addition to the required basic standards, reference solutions, particularly in mechanical engineering, electrical engineering and electronics and in construction, must be standardized.

--Programming Languages

The content of this complex consists of modern, high-level programming languages such as Fortran 77, Pascal, ADA, C and others for the portability of software, as well as of the realization of program transformations and of the language link between different classes of computers. The corresponding ISO documents, such as ISO 1539 and ISO 7185, as well as standards of other countries with advanced technology, are to be used as a basis for the formulation of standards for particular technical fields.

--Bases for Quality Control, Software Technology

In order to ensure the high quality of software, unified specifications for quality planning, assurance and control must be standardized on the basis of the life-cycle model, as well as quality characteristics for software products and testing criteria for projects in this complex.

Moreover, standards for software components (text processing, data compilation, etc.) and software development tools must be developed.

--Selected Special Operating Systems

This complex contains standards for basic software of such operating systems as measuring, analyzing and testing technologies, process control,

microprocessor programs, computer, machine and robot control systems, etc. for the determination of unified programming languages, interfaces and software components.

--Unified Documentation

In these standards framework specifications are given for hardware and software documentation on the basis of the CEMA standard for the unified system of program documentation (ESPD) and with regard to IEEE 830, with the objective of greatly expanding the multi-tasking capability of software.

The first tasks of this program have already been taken up in the Robotron and Data Processing combines. Before the end of this year, standards will have been established for programming languages, FORTRAN 77, for the documentation of software and for the graphics core system GKS 2-D. The scope of these standards and the speed with which they are being developed, however, are not yet adequate. In 1987 and in subsequent years, the responsible combines and/or facilities must devote a much larger percentage of their research and development capacities to dealing with standardization tasks in the plans for science and technology, in order to rapidly achieve the national economic goals that are intended as a result of standardization. The tasks in this area which are being carried out in the scientific facilities and at the universities must also contribute more than has previously been the case, and the results of these studies must lead to the design of a standard that can be confirmed.

Furthermore, tasks must be immediately actuated on the basis of the program described here in the industrial sectors under the leadership of the coordinating offices for standardization, which serve to unify software in the area of responsibility and thereby the rational introduction of computer solutions.

The ASMW and the Verlag fuer Standardisierung [Publishing House for Standardization] will directly support all related activities. In order to ensure that the combines and facilities are provided with rapid access to needed basic software standards, a "thematic standing order" will be established by the publishing house. All users will thereby be able after placing a one-time order to acquire a complete version of all newly-confirmed standards of this particular topic immediately after publication.

12792
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EAST EUROPE/COMPUTERS

POLISH 8-BIT, 16-BIT COMPUTERS DISCUSSED

Polish 8-Bit Computers

Warsaw PRZEGLAD TECHNICZNY in Polish No 15, 13 Apr 86 pp 16-17

[Article by Roman Dawidson: "Polish 8-Bit Computers"]

[Text] The pace has been stepping up, and the world can hardly catch its breath in this rush of development in computer science. At any meeting of specialists in this field, one can hear references to fourth generation and fifth generation computer systems. At the same time, the differences between various types of machines are being erased. Some of them, previously regarded as professional computers, are now showing up with increasing frequency in homes as so-called amateur equipment. The increase in technical capabilities is being paralleled by development of a system of connections, that is, a network is coming into being. Properly speaking, only now can we say that informatics is beginning to have an impact on daily life. A third element is the growing software market, which is doing what it can to satisfy the most sophisticated needs.

I have the feeling that one of the fondest dreams of our manufacturers is a break in this rush. They feel like yelling out, "hey, stop at least for a while, until we find out what you're doing and and what you're talking about." But in a more serious vein it is to be pointed out that we have the high level of our computer scientists to thank for the fact that we have not lost contact with the leading edge throughout the world (in theoretical questions, of course). They are striving with admirable zeal to keep up with the best. Consequently, as I have said, we are keeping abreast of what is happening. But the question must be asked, how long will this still be possible?

But let us come back down to Earth, that is, to the capabilities such as we have in Poland.

Meritum I and II

When I examined the first models of this computer at the Poznan Fair several years ago, it seemed to me that we had succeeded rather quickly in crossing a threshold. A Polish personal computer appeared on the market in a relatively short time. The fact that it is still imperfect is unimportant. At that time, all companies were searching for different solutions. Our best manufacturers definitely rose to the top, but the Meritum, while it did change, ...

Since we have already written about the Meritum-I on a number of occasions, we will now discuss its successor, the Meritum-II, at greater length. This new model from the Zaklady Urzadzen Komputerowych [Computer Equipment Plant] in Zabrze has expanded RAM [random-access memory] of 32/48 kilobytes. It is outfitted with an additional parallel interface for connection to a 5-1/4-inch floppy disk controller (equipped with a Z-80 microprocessor) and software-controllable audio signals. The number of alphanumeric characters displayed has been increased to 96. Cyrillic and lower-case Latin characters have been introduced in addition to the Polish language character set. The basic language is Basic-Meritum 2.0. There are also plans for outfitting the computer with peripherals such as a parallel printer adapter and television adapter, as well as new software accessible from magnetic tape (PASCAL and BASIC language compilers, a Z-80 assembler, etc). There are, of course, many more details, but what I have given here should be enough for persons who keep up with what is happening in the world in this area.

ELWRO-700 or SOLUM Microcomputer

This computer was to be the premier product of the Zaklady Elektroniczne [Electronics Plant] in Wroclaw. It has the UB 880 D microprocessor and is made in three versions: a so-called economy model, the semigraphic SOLUM E with 8 kilobytes of ROM [read-only memory] and 16 kilobytes of RAM; a graphic version, the SOLUM G, with 12 kilobytes of ROM and 32 kilobytes of RAM; and a terminal version, the SOLUM T, with 16 kilobytes of ROM and 32 kilobytes of RAM. The computer is equipped with an alphanumeric keyboard in the QWERTY arrangement with the Polish alphabet and additional function keys. This solution is applied in the majority of personal computers made. Elwro, however, following the example of Sinclair, has gone even further. The standard names of BASIC language commands and functions have been assigned to individual keys. Although this does permit entry of commands by pressing individual keys, it complicates operation by reducing the transparency of the keyboard. This method might be compared to the idea of entering whole words or sentences on a typewriter rather than individual characters. This would also presumably be faster, but whether it would be better is open to question. Although the function key system employed recurs in the majority of designs of equipment in this category of solutions, the keys are segregated as much as possible into individual groups which do not blur the picture of the conventional alphanumeric keyboard.

But let us get back to the Elwro product as a whole. The SOLUM works with any television receiver. Provision is made for two screen display versions, one semigraphic (24 lines each with 32 alphanumeric and graphic characters) and the other graphic (196 lines by 256 pixels [picture elements]). It can be used with the D-100 dot-matrix printer, for which purpose the computer has an appropriate interface and software. A standard tape recorder can be used as the external storage medium. The Elwro-700 is controlled by an integrated monitor-BASIC interpreter (in EPROM [erasable programmable read-only memory]). On power-up it performs self-testing, and after a time is ready to receive and execute BASIC commands.

The ComPAN-8

The designers at Mery-Elzab have added to the microprocessor system in this computer RAM modules, a floppy disk controller, and video RAM modules which

display the image memory content on a CRT [cathode ray tube] monitor. By introducing a so-called page register, they have managed to add five lines to the address bus of the 8080A microprocessor. This allows utilization of up to 2 megabytes of RAM. The video-RAM (image memory) module, on the other hand has a capacity of 32,000 12-bit words, with the possibility of expansion to 64,000 words.The ComPAN can be connected to 4 5-1/4-inch and 8-inch floppy disk drives for single-density or double-density disks. The printer supported by the system is the DZM-180. The basic operating system of the computer is compatible with CP/M 2.2; thanks to the available software, it can use text editors, compilers, and interpreters of several languages (BASIC, FORTH, FORTRAN, PASCAL).

The ComPAN is, of course, an 8-bit computer, and this limits its memory capacity to 64 kilobytes. As I have already mentioned, the address bus of the 8080A microprocessor has been expanded by five lines elaborated from a page register. It is accordingly possible to use up to 2 megabytes of memory divided into 64-kilobyte pages.

The monitor screen is divided into windows in which portions of memory are displayed. A so-called system window, 4 80-character lines, has been developed. The remainder of the screen is taken up by the operating window, which holds 24 lines by 80 characters in the character mode, 30 by 80 in the character-graphic mode, and 288 lines by 640 pixels in the graphic mode. The MERITUM I and II and the SOLUM are typical home or personal computers, according to the rather unsettled classification criteria in use. They can also be used successfully for learning and for performing simple tasks. Despite the fact that the ComPAN is an 8-bit computer, because of the enhancements indicated above it may be regarded as a professional computer suitable for use in engineering design and in medical diagnosis and may also be used as a smart terminal in computer systems.

This brief description of 8-bit computers made in Poland obviously is not an exhaustive treatment of the subject. We will try in the near future to deal with the remaining ones made both by national and foreign companies.

Polish 16-Bit Computers

Warsaw PRZEGLAD TECHNICZNY in Polish No 17, 27 Apr 86 pp 16-17

[Article by Roman Dawidson: "Polish 16-Bit Computers"]

[Text] The era of equipment using 8-bit microprocessors seems to be slowly passing away. The personal and home computers in production are their last bastion. But even here things are beginning to change. To put it bluntly, after a certain time the potential offered by these small machines ceases to be enough. With increasing boldness, companies are placing 16-bit computers for non-professional use on the market, although I do not know if the computers should as yet be defined as "non-professional." (For example, Atari Corporation has come out with the 520ST, with 1 megabyte of RAM and 192 kilobytes of ROM.) The price of around 3,000 deutsche marks and the reduced availability of software continue to be serious deterrents, of course, but software availability is merely a question of time.

Now it is time to turn our attention to domestic products, but before we do, I should like to offer an additional comment on the question of prices. During the exposition at which the accomplishments of the Polish informatics industry were presented, I asked one of the designers about the price of the equipment displayed. The response was an indifferent shrug, accompanied by the remark that this is no concern of the computer engineer. It seems to me that such an approach to the problem would evoke astonishment among professionals in this field throughout the world. Every person who designs a machine must bear in mind that its cost should be in keeping with the category of equipment and the prices offered by competitors for similar products. Only persons who are doing something really new, that is, who are blazing trails, should in my opinion be exempt from this obligation. But in a situation in which typical computers made in different versions by dozens of firms throughout the world are making their appearance, I think it is unreasonable not to know if what has been produced can be marketed at a competitive price.

But let us go on to specifics. As I have already pointed out, what we are currently producing represents the average European level. I expressly say European rather than world level. This is not a slur, of course. As the saying goes, during the current stage we are unable to do more, so let us do what we are able to do systematically and at the lowest possible cost. After all, we can accomplish quite a lot even with this equipment.

The Mera 660

This is a typical 16-bit professional computer. Its manufacturer, Meraster in Katowice, advertises it as equipment suitable for operation in networks, graphics systems, etc. It was a good idea to adopt a modular design both for the hardware and for the software that has been developed. The computer can be adapted for different purposes and connected to networks of different types by use of a variety of peripherals. It can support alphanumeric monitors, semigraphic and graphic X-Y plotters, and disk, tape, and semiconductor memories. The programming languages are MACRO, MUBASIC, BASIC, FORTRAN, PASCAL, MODULA II, CASIC, C, and FORTH.

Meraster also proposes use of the computers it manufactures in setting up local area networks. Its basic characteristics are the possibility of connecting 64 peripheral computers, the possibility of using intermediate stages in the form of so-called concentrators, a communication line length of up to 1 kilometer, and a transmission rate of up 1 kilobyte per second.

The Elwro-800, an 8/16-Bit Computer System

The Wroclaw plant estimates the domestic demand for computers of this type to be 100,000 systems. It should be kept in mind that production of 8-bit computers has now begun in all the socialist countries, and 16-bit machines are already being made in Bulgaria and Hungary. Production of them will begin in 1986 or 1987 in the USSR, Czechoslovakia, and the German Democratic Republic. Consequently, the Wroclaw microcomputer continues to have good prospects for export. The Elwro-800 is an entire family of modular microcomputers which have been designed mainly for automation of office work. They may also be used as remote intelligent terminals, units controlling production processes, robots, etc, and as design assistance systems. The computer

is an equivalent of the LSBC system made by the Intel Company, which is the world standard for machines operating in real time. At the same time, however, it is compatible with the IBM-PCT, which in turn is the world standard for the group of professional personal computers. This well conceived system was developed by the Automation Department of the Poznan Institute of Technology and by the Institute of Computer Systems for Automation and Measurement in Wroclaw, and, as I have already noted, it is manufactured by the Elwro Electronic Plant.

The greatest advantage of the Wroclaw computer is its modular structure. This permits creation of a variety of systems tailored to individual needs in the best possible way. Several microcomputers can operate within one system, and the so-called multiple-bus feature allows free communication between modules. A typical Elwro 800 may be made up of a 16-bit or 8-bit microcomputer, an intelligent floppy disk controller, a RAM system of 256 kilobytes, atelevision display controller plus keyboard, and a Winchester hard disk storage device. The system is also equipped with local network graphic color monitor controllers and provision for multichannel serial transmission.

The microcomputer supports monitors of the Mera 7953N type or their equivalent, and also the Neptun 156. Several types of dot-matrix printers and daisywheel printers can be connected to it. Data are stored on 8-inch or 5-1/4-inch floppy disks. Winchester hard disk storage devices, graphic monitors, digitizers, and plotters are to be added to the product mix in the near future.

The system is equipped with a 2-megahertz or 5-megahertz clock and with 128 plus 256 kilobytes of RAM, with the possibility of expansion to 1.2 megabytes. The system can serve a maximum of five users and supports such programming languages as BASIC, ASSEMBLER, PASCAL, FORTRAN, C, and PI/M LOGO.

This ends our presentation of Polish 16-bit computers, I hope temporarily. It is difficult at this time to predict the course which will be taken by further development in this area in Poland. We have personnel and an industry ready to produce the computers. Of course, we lack a Polish-made microprocessor of this type, but this is just an obstacle to be overcome. The most important thing in my opinion--as I have already pointed out--is that nothing can be accomplished without paying attention to product cost. Who would buy a Meraster or Elwro product if similar equipment were to be marketed throughout the world at a much lower price, no matter what given rate of exchange we use to convert a symbolic dollar?

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EAST EUROPE/FACTORY AUTOMATION

DEVELOPMENT, UTILIZATION OF INDUSTRIAL ROBOTS IN CSSR

East Berlin FERTIGUNGSTECHNIK UND BETRIEB in German No 4, 1986 pp 243-244

[Article by Dr.-Ing. J. Zan, Research Institute of the Metal Industry (VOKOV) Presov, CSSR: "Development and Use of Industrial Robots and Manipulators in the CSSR"]

[Text] 0. Introduction

The government agencies of the CSSR pay great attention to the development of robotization in their country. In 1981, the Czechoslovakian government adopted the "Conception for the Development of Industrial Robots and Manipulators" (IR and M). The main goals and tasks are listed in the national target program "Robotization of the Technological Processes." In the period from 1986 to 1990 the main task of this national program will be the creation of more than 3,700 robotized sections with a maximum degree of integration in more complicated and complex manufacturing sections, lines and departments. To achieve this goal, at least 7,000 industrial robots must be used.

1. Czechoslovakian Industrial Robots and Manipulators

In the CSRR a number of industrial robots and manipulators were developed which can be used to equip robotized manufacturing systems in accordance with their design and technical parameters.

--Automatic Manipulator AM-1-T

Can be used for the simple handling of objects with a weight of up to 1.25 kg in forming technology. During a work cycle, the standard version of the manipulator receives parts from a press and feeds a second press. In this process a storage space is used in the intermediate position. On the basis of the standard version modifications were developed for the handling in the press work area (parts transport between tools) between the individual operations.

--Automatic Manipulator AM-5

It is intended primarily for use in forming technology. With a load capacity of 2.5 kg per arm the standard version of the manipulator has two arms, but for certain applications it can also be equipped with a third arm. All manipulator subassemblies are pneumatically driven.

--Modular Manipulation System M-63

It is intended for a wide range of applications and for the solution of different complicated handling tasks during and between operations. The system is used in robotized complexes for machining, forming, diecasting, and welding. It consists of a complex of individual units, subassemblies, and components which can be assembled into manipulators with different degrees of complexity.

--Manipulation System AM-80

It is intended for executing complicated handling tasks. The conception of the system is based on the modular-subassembly-principle. The drive units work on the basis of hydraulic servo drives.

--Industrial Robot PR-16-P

It is intended for the automatic operation of technological and other equipment and is used for handling objects with a weight of up to 16 kg. The robot works in the cylindrical coordinate system with the arm having three axes of motion and the gripping hand having two.

The individual motion subassemblies are equipped with pneumatic drives (with point-to-point positioning control and a measuring system (with stops).

The individual stops are sensed by non-contact transducers.

--Industrial Robot PR-32-E

The PR-32-E is intended for the automatic operation of technological equipment and for a few other technological tasks (welding, application of paint coats, and the like). The robot is designed according the the monolithic system; it works in a spacial point coordinate system. Electric DC servo drives of the MESOMATIK type were used in the design of the robot.

The advantages of the robot are based on the characteristics of the point-to-point positioning control RS-3. A microcomputer is used as an automatic control block. For point-to-point positioning control a maximum of six axes are controlled; for continous-path-control a maximum of three of the total number of axes can be controlled interdependently. Programming is done manually using a manual control block for the teach-in method. The memories and blocks for motion control are arranged in individual subassemblies. This way the control system can be set up as required by the various tasks.

--Industrial Robot OJ-10

It is intended primarily for use in arc welding. The OJ-10 features five axes of motion, it has a load capacity of 10 kg and specific adaptive properties. The adaptive system makes it possible to determine strategic points, the transformation of the welding path drawn and the control of the burner at the actual welding seam.

--Adaptive Industrial Robot APR-2.5

It is intended for use in welding. The conception for its configuration is based on the modular principle. The individual axes of motion can be driven by electrical servo drives or by pneumatic drives.

- Adaptive Industrial Robot APR-20

The APR-20 can be used for arc welding. It is equipped with electrical single-phase servo drives which are controlled by the control system RS-A4. The adaptive properties of the robot make it possible to respond to geometric variations in dimensions of imprecisely manufactured welding parts or to parts which are clamped imprecisely in the folding machine and to correct the path of welding movements to ensure the required quality of the welding seam.

--Automated Transport System between Operations AST

It is intended for use in more extensive robotized manufacturing systems. Based on the hanging suspension transport principle the system has independently controllable transport cars (load capacity up to 250 kg).

2. Robotized Manufacturing Systems

In the CSSR a few robotized manufacturing systems were introduced and prepared for operation using automatic manipulators AM-1-T and AM-5, special purpose manipulators (completed from basic components, subassemblies and units of modular manipulation system M-63) and industrial robots PR-16-P and PR-32-E.

The robotized manufacturing system for the sheet metal forming of three types of steel can parts was introduced using automatic manipulator AM-1-T. For forming the spout--which requires six technical operations--a flexible manufacturing system of the combination as in modification "A" is used, for forming the cover and support a system as in modification "B" is used. The blanks reach the manufacturing system via a rotating hopper.

The use of automatic manipulator AM-5 is prepared in the sheet metal forming system for two types of gearwheels for a company which manufactures small motorcycles in the USSR. In three operations the products are prepared on eccentric presses LEK-250 and LEK-160. The blank storage unit ZL-500 from manipulator AM-5 and movable swivelling subassemblies POJ are used in the system. The microcomputer system RG-1-Z will control the technical and handling functions of the complete manufacturing system. The robotized

manufacturing system for machining shafts in ten sizes (diameter 80 to 130 mm, length 700 to 1,500 mm, weight 38 to 115 kg) using six manipulators M-63 was introduced. With two shifts the producitvity of this system is 2,900 shafts/year (average lot size 630 shafts) with 40 production lots per year. Shaft blanks with faced fronts and center holes pre-drilled from two sides which are stacked in the step transport cars by the worker are fed to the system. Two forging lines using industrial robots PR-16-P were introduced.

On the "A" line forgings for ten sizes of traction wheels and ten sizes of driven wheels of high pressure gear pumps are produced in two operations: pressing and calibrating the forging (during preheating). The first robot takes the heated blank from the ramp at the heating oven and feeds it to the forging die of the press. After pressing, the second robot takes up the forging and transports it to the next press for calibration. Then, the third robot places the finished workpiece in the pallet.

On the "B" line forgings of ten sizes of pump housings made of Dural are produced in three operations: pressing, punching, and cutting. Here, the robots perform similar handling functions as on line "A". The lines have a central control (digital program control) of programmable automatic machine HC-901. Transition to the production of another forging size is sufficiently flexible; only the actively used parts of the tools and only the gripping parts of the robots are exchanged.

Based on the applicability of industrial robots PR-32-E a robotized manufacturing system for arc welding small welding parts was constructed and put in operation. Putting in operation the robotized manufacturing system resulted in absolute savings of 12.3 workers and a payback period of 5.1 years.

By using industrial robots the manufacturing system for machining axially symmetrical parts (e.g., flanges) was also implemented. The transport of blanks, fixtures, and waste between operations is ensured by a system of inductively controllable cars which connect the technical complexes and storage shelves without human interference. The introduction of the manufacturing system with a standardized structural design includes the following essential innovations:

--automatic switching of handling equipment between operations and during operations

--simultaneous control of several industrial robots by a microprocessor system with automatic distribution of technical data and handling programs

--modular design of robotized complexes as a prerequisite for repeated use of software

--technological flexibility of the manufacturing system in a specific range of manufacturing tasks

--use of domestically produced components for the manufacturing system.

Calculations indicated that with three shifts the introduction of this system reduces the number of workers by nine and increases labor productivity by 30 percent. Taking into account the necessary investments and operating costs the system will be amortized in 2.3 years.

3. Conclusions

Automating discrete manufacturing in machine construction on a complex level (centralized control, use of industrial robots and manipulators) by creating robotized manufacturing systems to fulfill certain production tasks makes it possible to streamline and modernize the production of Czechoslovakian machine construction. The first examples for the introduction of robotized manufacturing systems using industrial robots and manipulators are the result of the consistent approach to the solution of technical, technological, organizational, and social tasks of complex automation not only in the stage of scientific investigations, but also in the research and development and introduction stages.

BIBLIOGRAPHY

1. Stojny, M., Gavrila, M., "Experiences with Projecting Automated Workplaces with Automated Manipulators," "Mechanisierung und Automatisierung der Produktion" [Mechanization and Automation of Production], Moscow, 1980, 2.

2. Zan, J., Gavrila, M., "Use of Industrial Robots and Manipulators in Flexible Automated Production," "Seminar of the Economic Commission of the United Nations for Europe on Systems of Flexible Production," Sofia, 1984.

3. Buda, J., Hajduk, M., Kozak, D.,"Production Profile of Automated Cells Using Industrial Robots," "Conference Materials of the 13th ISIR Robots 7," Chicago, 1983.

4. Gavrila, M., Stojny, M., Zan, J., "Areas of Application for Robots and Manipulators which were Developed at VUKOV Presov," "Conference Materials RO-MAN-SY 81," Warsaw, 1982.

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EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

FRG VIEW OF NUCLEAR POWER PLANTS IN GDR, OTHER CEMA COUNTRIES

Frankfurt/Main FRANKFURTER RUNDSCHAU in German 14 May 86 p 23

[Article by Wolfgang Stinglwagner: "Atomic Energy in CEMA Countries; The GDR Too Has Nuclear Power Plants of Soviet Design; Danger From the East?/Safety Standards and Level of Development of Reactors in East Europe"; boxed material as indicated]

[Text] Bonn--With alarming clarity the Chernobyl catastrophe has shown us that what happens farther to the east in the field of nuclear energy use cannot be a matter of indifference to the people of central Europe. The intense discussion about the construction of nuclear power plants and processing plants in the FRG has all too readily overlooked the fact that in the eastern part of Europe a significant nuclear power potential has developed, the safety risks of which are just beginning to be discussed here in our country.

Is a time bomb ticking there? And do the other East European countries--including the GDR--also not have an increasing number of nuclear power plants of Soviet design, which could one day expose us to similar dangers--with shorter distances into the bargain? Are the explanations recently given in many Western commentaries really true that the danger of radiation from the East is particularly threatening precisely due to factors typical of the system?

The peaceful use of nuclear energy has been a project with which the Soviet Union has, in fact, linked great ambitions for over 30 years now. After all, the first nuclear reactor was tested there as early as 1954. That reactor of the RBMK type was a predecessor of the reactor damaged at the end of April in Chernobyl: RBMK is the Russian abbreviation for "high capacity boiling water reactor."

Because of its special design, the Soviets regarded the graphite moderated RBMK as especially safe and dispensed with construction of a containment structure according to the Western example--a shell of steel and concrete constructed at great expense which offers protection both in the case of accidents in the reactor and from influences from the surroundings (such as an aircraft crashing into it) and is supposed to prevent the excursion of radioactive materials.

As a matter of fact, no major accident had occurred in the several decades of operation of this type of reactor. The 1,000-megawatt reactors installed at Chernobyl are not the only ones of their type in the USSR. The Leningrad nuclear power plant alone has a total of four RBMK reactors of 1,000 megawatts each; there are also reactors of this type in the Kursk nuclear power plant (3,000 megawatts). In fact, the first RBMK block with a capacity of 1,500 megawatts went into operation at the end of last year near the Lithuanian city of Sneckus.

Like other eastern European countries, the GDR has nuclear reactors of Soviet design. They are, however, not RBMK reactors but rather pressurized water reactors, likewise developed in the USSR within a second line of development. They fundamentally demonstrate many similarities with the pressurized water reactors in predominant use internationally.

In the West, the model designated WWER-440 (a pressurized water reactor with 440 megawatts of installed capacity), commonly used for a long time now, is, however, not considered so safe as those manufactured in the FRG, for example. For a long time the WWER-440 has not been equipped with comparatively expensive additional emergency cooling and control systems and also includes no containment structure. Even the WWER reactors used in the GDR include as protection merely a simple reinforced concrete mantle which is assembled according to a steel cellular sandwich design developed jointly with the Soviet Union.

It has of course become clear after the long years of operation of the two WWER-440 reactors of Soviet origin installed in the Finnish Lovisa nuclear power plant that the immanent safety of the Soviet pressurized water reactors is very great and for this reason the occurrence of cases in which the protection of a containment structure must be called into play could be even more improbable than with many reactors of Western design. Also, no exceptional accidents have been reported from East Europe where a relatively large number of this type of reactors are currently in operation.

Yet, the potential alone which is being built up in East Europe, which has remained rather far behind for a long time in this field, deserves a more thorough consideration from the standpoint of safety--even though it is not a question of the "mishap reactor type" RBMK, found only in the Soviet Union and also not planned to be an export reactor.

The plans for extension of nuclear energy being pursued within the Council for Mutual Economic Assistance (CEMA)--the East European economic alliance--were always ambitious if not always crowned with overwhelming success for the planners. If, within the Soviet Union's partners in the alliance, construction of nuclear power plants went forward only sluggishly, it was because they were basically dependent on technical documentation and reactor deliveries from the USSR, the sole developer of nuclear power plants in East Europe. Although construction proceeded considerably more slowly than in West Europe, the nuclear power potential of East Europe is nevertheless increasing steadily. This is no less true for those CEMA countries bordering on the FRG or not too far away.

Increasing Potential

Apart from the Soviet Union, Czechoslovakia is the only producer of nuclear power plants in CEMA; their own plants for manufacture of reactors and of the most important accessories including turbo sets have been constructed according to Soviet technology by the Skoda public company of Pilsen.

Production began with WWER-440 reactors, 10 of which are to be installed in the CSR itself by 1990, 3 in the GDR, and 4 each in Hungary and in Poland. At the end of the 1980's production is to be converted to WWER-1000 reactors (electrical output: 1,000 megawatts) and a considerable number of these larger light water reactors are to delivered to other CEMA countries.

This larger reactor is supposed to be safer compared to its little brother the WWER-440 because its primary loop will be equipped with a containment structure in the Western fashion. A prototype of the WWER-1000 produced in the Soviet Union was placed in operation there in Novovoronezh in 1980.

In the South Bohemian Temelin nuclear power plant, for which the first use of the Czechoslovak type of WWER-1000 is planned, four blocks are to built, each with a separate control room to increase the safety level of the control and emergency systems. According to the plans known so far, the first 1,000-megawatt reactor of this type is to be ready by the end of next year, the other three by 1990. Also by that time, two each of the new reactors are to be delivered to Bulgaria and Romania and one to Hungary.

In all, the Czechoslovaks intend to construct nuclear power plants with a capacity of approximately 10,000 megawatts by the year 2000 and to produce over 50 percent of their electricity based on nuclear energy with the seven 440-megawatt and five 1,000-megawatt reactors currently available and yet to be built.

Nor has the neighboring country of Hungary been idle. At the beginning of 1983, the first nuclear power plant there was put into operation at Paks, likewise equipped with a WWER-440 reactor. Expansions are planned.

In Poland, which has large coal power plants, no commercially operated nuclear power plant has yet been built. The chronic shortage of investment capital is also a prohibitive factor there. But the situation has begun to change there also.

In January 1982, the ministerial council decided to build the first Polish nuclear power plant near Koszalin with an installed capacity of 1,760 megawatts (four WWER-440 reactors). The nuclear power plant is scheduled to be placed in operation in 1990. At the beginning of 1984, Polish Minister of Environmental Protection Jarzebski stated in an interview that Poland had absolutely no chance of getting by in the long term without nuclear energy.

In spite of the opposition obvious in the Polish population against nuclear power plants, a second nuclear power plant is now to be put up--equipped with four WWER-1000 reactors. The planned beginning of construction is still 1987. By the turn of the century, the Polish government would like to install

nuclear power plants with a capacity between 7,860 and 9,860 megawatts. However, it is already foreseeable that delays due to the shortage of foreign currency and investment capital will soon be felt.

Currently the European CEMA countries have nuclear power plants with a capacity of almost 35,000 megawatts; the Soviet Union has nuclear power plants with over 28,000 megawatts, and approximately 7,000 megawatts have been built in the rest of East Europe. The "Complex Program" agreed upon last year at the 41st (extraordinary) CEMA council session plans to expand the total nuclear power output in CEMA to 100,000 megawatts by 1990. Even assuming that this plan cannot be fully implemented, it is still to be expected that East Europe will equip itself with a clearly increasing number of nuclear reactors in the coming years.

Even the GDR, where only a sluggish expansion of nuclear power plants occurred in spite of originally ambitious plans, cannot remain on the sidelines. Because of the lack of foreign currency, the great energy demand of the economy and the population in the GDR has so far only been possible to satisfy primarily by heavy reliance on the energy source of brown coal, available on its own territory, although quite low in quality. Last year approximately 312 million metric tons of it were mined; the GDR is by far the world's largest producer of brown coal.

However, due to the fact that brown coal deposits are not infinite, even the GDR leadership considers this fuel, the extensive use of which is furthermore linked to considerable air pollution, as a temporary solution. Even in the GDR, planners are pursuing ambitious nuclear energy projects.

Disillusionment Following Chernobyl?

From 17 to 20 April--therefore shortly before the Chernobyl accident--the 11th SED Party Congress took place in East Berlin. The political leadership of the GDR left no doubt that the expansion of nuclear energy use pushed for is a matter of great concern.

No less than Chairman of the Council of Ministers Stoph thus made the following profession of faith in nuclear power in his speech for clarification of the 5-year plan directive for the years from 1986 through 1990: "The timely start-up of new capacities in the neighborhood of 2,500 megawatts must be guaranteed at all costs. The North Nuclear Power Plant must be ready by 1990. The test run of the first 1,000-megawatt reactor block in the Stendal nuclear power plant must be prepared for. Furthermore, we must assume that by 1990 the prerequisites for the further expansion of nuclear energy will be established."

According to the 5-year plan directive, which serves as the orienting basis for the 5-year plan to be announced in December, nuclear energy's share in total electrical current generation is to be increased from the present 11 percent to 15 percent by the year 1990; 124 to 128 billion kilowatt hours of current are expected to come from the GDR's nuclear power plants at that time. The first block of the Stendal nuclear power plant is supposed to go into operation in 1991.

Even after the Chernobyl catastrophe, it is not likely that the GDR leadership will make appreciable cuts in its nuclear energy program. There are several grounds for this. Thus GDR nuclear power experts do not tire of pointing out that a completely different type of reactor from that in Chernobyl is used in the GDR. In contrast to those in Chernobyl, the larger reactors in Stendal are to be equipped with containment structures and emergency cooling systems in the Western fashion anyway.

And furthermore: According to reports given at the 11th SED Party Congress, brown coal currently accounts for 70 percent of primary energy consumption. However, this indigenous fuel is not infinitely available. Also, in the GDR only relatively slight relief for the energy balance is hoped for from energy conservation. Foreign currency is lacking for expansion of energy imports.

All of the hopes of the energy planners in the GDR are therefore focused on nuclear energy; they will not allow themselves to be diverted from these hopes even by the experiences of Chernobyl. The first steps have already been taken.

Nuclear Power in the GDR

Based on an agreement concluded between the GDR and the Soviet Union on 17 June 1956, the Soviet Union delivered to the GDR the technical plans, the installations, and the enriched uranium for the operation of the first GDR nuclear power plant in Rheinsberg. The 70-megawatt pressurized water reactor of the WWER type installed there began operation in 1966.

The GDR's second, considerably higher powered nuclear power plant was developed in Lubmin, 23 kilometers from Greifswald. The power plant designated North Nuclear Power Plant has been generating current since 1973 and now has four reactors of the WWER-440 type. Its capacity is to be doubled by 1990, with the start-up of the fifth reactor block scheduled for later this year.

A third nuclear power plant is currently under construction near Stendal on the Elbe. It is to be equipped initially with two WWER-1000 reactors, with an overall capacity of 4,000 megawatts planned for the long term.

The GDR has generated from 11 to 12 percent of its electrical energy in recent years with the two nuclear power plants currently used commercially--there is yet another small research reactor in Rossendorf near Dresden, which is not under consideration here. However, nuclear power should soon take on considerably greater importance in the GDR.

By the turn of the century the planners would like to have reactors with approximately 10,000 megawatts available and to increase this installed capacity again to approximately 23,000 megawatts by the year 2020 in order to guarantee the energy supply when the indigenous brown coal reserves begin to run out. Therefore in the GDR also a nuclear energy contribution of over 50 percent of electrical current generation is sought for the long term.

Compared to the FRG, where it is expected that more than 24,000 megawatts will already be installed by the end of this decade, the GDR plans still look rather modest. However, it is certain that there also nuclear power plants are developing on such a scale that issues of environmental protection and safety are gaining considerably in relevance. Even in the GDR's neighboring countries people will not avoid worrying about the safety of the nuclear power plants installed in the GDR. An exceptional feature of the use of nuclear power in the GDR is to be seen especially in the fact that the increased inclusion of nuclear energy in the many-branched district heating network is scheduled for the turn of the century. In the GDR, there is an extensive district heating system, to which more than 1.3 million homes are currently connected. This is approximately 20 percent of the total housing stock. (In the FRG this proportion lies well under 10 percent.) In addition, over 7,000 public buildings such as schools, department stores, or hospitals as well as over 2,000 industrial firms are supplied through district heating.

At present, 111 heating stations and 38 combined heating and power stations deliver heat to the public network; 140 combined heating and power stations and 650 heating stations for industry and public facilities are added to that. All are predominantly equipped with brown coal furnaces. But this is to change soon.

The amount of brown coal used for nothing but heating buildings is to be reduced decidedly. The North Nuclear Power Plant is already supplying incidental heat to the city of Greifswald over a distance of more than 20 kilometers.

Several dedicated nuclear heating stations, currently under development in the Soviet Union, are to be put into use soon. There, the specially applied type of reactor called "AST-500" is planned for supplying heat to cities such as Gorki, Voronezh, and Archangel. GDR researchers are already working all out on plans dealing with special systems for the safety of the heated cities from radioactive radiation even in the case of unforeseen events.

These projects are particularly explosive because district heat cannot be transported over too great a distance due to the heat loss involved. Consequently, nuclear heating stations have to be built in the immediate vicinity of the populated areas to which the heat is to be delivered.

The AST-500 reactor is a descendant of the WWER pressurized water reactor of Soviet design. Because it is to be used under reduced operational parameters, it is characterized by the authorities in the USSR and the GDR as especially safe. Its construction in the vicinity of cities would therefore be defensible. Admittedly, almost nothing has been said to date about whether or not the nuclear heating stations would be equipped with a containment structure and other expensive security systems.

Growing Criticism

As heard from Poland, since the Chernobyl accident, there has been increasing criticism there of the previously unadulterated optimism with which the economic planners were accustomed to presenting the advantages of the use of

nuclear energy. The population has become uneasy. And while Chernobyl has not been merely an ecological and technological-economic disaster for the Soviet Union, but also demonstrated with frightening clarity just how far they still are there from the road to more open and more self-critical reporting of events mapped out by Gorbachev, the population of the GDR was at any rate more strongly sensitized and (somewhat) better informed through the Western media.

The Chernobyl accident ought to make them more critical about the explanations given by their own political and economic leadership which has long sought to convince them that an accident of the Harrisburg type would only be possible under capitalism since in that case personnel who were not adequately qualified were employed in order to save the costs of highly qualified crews.

Klaus Fuchs of the GDR Academy of Sciences attempted to explain this 2 years ago in the journal SPECTRUM with the following words: "All too frequently 'human error' is cited as the reason for a disruption. The nadir of disrespect for human capability and personality was clearly reached in the forward to the FRG translation of the official report on the accident in the American nuclear power plant near Harrisburg on 28 March 1979: 'Man is fallible, but the safety technology is good' is the quintessence of the statements of nuclear energy advocate Wolfgang Mueller; 'Man errs and so does technology,' is the assessment of nuclear energy opponent Robert Jungk."

Now the reliability of both has been discredited in the realm of the socialistic use of nuclear energy: of man and machine. Even though the detailed causes of the accident are yet to be clarified, it is however known--even from Soviet sources--that human inabilities and lack of discipline were both at play when technology failed at Chernobyl.

The danger of radiation from the East has become obvious to the people of the FRG; yet in principle we are also confronted with this problem in the West. Right after the Chernobyl accident, there is no grounds for pointing a finger at the East and ignoring the home-made risks.

Following Chernobyl it is important that it become clear to the people of the CEMA countries and particularly of the GDR that the use of nuclear energy--if it is pursued--has finally become and international problem. In the last 2 years the first contacts were made with the GDR in a few areas. In this regard, talks were carried out for example between representatives of the FRG government and the responsible authorities in the GDR--including the National Authority for Atomic Safety and Radiation Protection of the GDR (SAAS). The GDR participates, as do other CEMA countries, in the work of the International Atomic Energy Agency [IAEA] and has conducted training courses for foreign experts at its own reactors. In these courses the primary emphasis was the control of nonmilitary use of nuclear energy.

[Box]

From the Textbook

Because of the sharp increase in installed nuclear power plant output and because of the establishment of nuclear power plants in heavily populated

areas, continually increasing attention must be given to the issues of preventing the excursion of radioactive substances even in cases of accidents which are expected to be very infrequent. For this reason a containment structure is planned for the WWER-1000.... The containment structure consists of a reinforced concrete cylinder with a diameter of 45 meters. The reinforced concrete shell is clad on the inside with steel sheeting. Nuclear power plants with WWER-440 reactors will be constructed in two models--with and without containment structures.

With RBMK-1000 pressure-tube boiling water reactors there is hardly any danger of the excursion of radioactive substances if damage occurs. They therefore have no containment structure. It would also be extremely difficult to construct because of the large dimensions of the reactor.

From the textbook "Nuclear Power Plants" by T.Ch. Margulowa, professor of technical sciences, national prize winner of the USSR, published in the VEB Deutscher Verlag fuer Grundstoffindustrie, Leipzig, 1976, pp. 410 and 412.--The reactor which failed in April in Chernobyl (the Ukraine) was of the RBMK-1000 type.

12666
CSO: 2302/24

EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

USE OF FLEXIBLE MANUFACTURING SYSTEMS IN CEMA COUNTRIES

Warsaw PRZEGLAD TECHNICZNY in Polish No 12, 23 Mar 86 p 24

[Text] At the 40th session of CEMA an agreement was signed for cooperation in the production and use of flexible manufacturing systems in the machine industry. Aside from the the undeniable benefits today's traditional automation: freeing people from hard labor and difficult working conditions, increasing the effectiveness of the economy and improving the quality of products, it also has certain defects. The automated workplace in general does not permit equipment to be rearranged to adapt production to market needs. This problem can be solved by introducing so-called flexible automation.

The essentials for creating flexible manufacturing systems (ESPs) are: digitally controlled machine tools, robots and other manufacturing systems and computer technology, especially microprocessors.

Their combination permits technological processes of utmost complexity to be reproduced for the machines, which would be operated by means of a corresponding program written into the memory of the guiding device. This program could be changed at will. ESPs have now been introduced into the machine tool, electrical, tool, automotive, electronic, and consumer goods industries, and also into other branches of the national economy. The widest application is found in tooling and to a lesser extent in assembly, casting, forging and stamping.

At the "heart" of the ESPs are the so-called technological modules. They consist of digitally controlled equipment for tooling, equipped with robotic mechanisms for positioning semifinished products and for their conveyance after tooling. Several types of modules have a system for automatic changes in tools and control systems. The automated transport is designed for conveying parts between operations and procurement of components from the warehouses. The majority of the ESPs in use or planned make use of robotic transport carriages and digitally controlled larry cars.

Materials, semifinished and finished products, and, when needed, tools and technological equipment are taken in and out of the automated warehouses.

The automated control systems sets the aggregates into motion, controls their work, its direction, the synchronization of labor and optimalizes the load and the system of tooling.

Technically ESPs are a large undertaking. Moreover, the following question arises: how effective are they from an economic standpoint? In other words, what is their productivity, their rate of amortization and other factors? We know, after all, that they are quite expensive.

The experience of the CEMA countries shows that such systems guarantee: an increase of labor productivity by a factor of 1.5-4.0; an equipment load of 17-20 hours per day; an increase in production of more than 30 percent calculated on the basis of investment costs; shortening the time it takes to make production preparation for new products by about 40 percent; an implementation period of 12-30 months; amortization in 1.5-3.0 year; and the possibility of freeing workers for lighter, more creative work.

What preparations have our countries made for introducing ESPs? Eight ESPs were in use in Bulgaria in 1985. The "Technoinwest" implementation organization was created, which conducts research on the usefulness of their applications in specific enterprises and works on completion of equipment and utilization of model projects. In the Technical Cybernetics and Robotechnical Institute of the Bulgarian Academy of Sciences they are working on a family of standard control systems for ESPs, using microprocessing technology. They intend to create and introduce 110 ESPs by 1990.

In Hungary there were 10 flexible manufacturing units in use at the beginning of 1985. Much attention was devoted to systems of automated control and diagnostics and the conveyance of parts and tools. In the opinion of the Hungarian specialists, this will make it possible to begin creating totally automated types of production.

In the middle of 1985 there were about 50 varied ESPs in operation at plants in the GDR for tooling rotating solids, casing elements, and cylindrical straight-toothed wheels. Intensive work is being done on automation for designing, creating guiding systems and the automation of assembly processes.

Flexible automation has been developing in Poland since the seventies. In the years 1977-1979 three automated production systems were produced for tooling casing elements and rotating solids. Seven flexible systems have now been introduced. Work is being done on creating automated systems for the needs of enterprises on the basis of microprocessing technology and systems for automating product designs.

In 1984 the USSR created 60 automated experimental-demonstration sections and 15 divisions. In the majority of these they tool traditional casing parts, flats and types of rotating solids. Work is being done on ESPs for the galvanizing, grinding, casting and stamping of products. The USSR intends to install 2000 ESPs by 1990 (in conjunction with totally automated sections, divisions and factories) and about 3000 systems for automated designing.

In Czechoslovakia there are plans for introducing ESPs into the the machine and electrical industries. The first stage of this work was completed in 1977 by installing a model integrated production section. The second stage was completed in 1984 with the introduction of systems of a higher degree of automation. At the beginning of 1985 there were 36 flexible systems in operation in the CSSR.

The development of flexible manufacturing methods is connected to the solving of inestimably complex problems, some of which transcend branch boundaries and require numerous expenditures. Active cooperation among our countries is therefore essential for achieving good results in a short period of time. Foreseen are the common planning and construction of the most modern technological equipment, industrial robots, automated designing and guiding systems for manufacturing preparations and technological processes, automated transport and warehouse systems, automated control and technical diagnostics and mathematical programming.

There is to be cooperation at all stages: in scientific-research work; in design, construction and testing; in the management of production, specializations, cooperation, market, assembly and arrangement of equipment and technical personnel; and in the training of personnel. Where necessary emergency groups of specialists will be created to solve individual problems.

All of our solutions and production should take into account scientific and technological development in the world and the needs of importers.

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CSO: 2602/36

EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

STATISTICS FURNISHED ON POLISH SCIENTIFIC ACTIVITY

Warsaw ZARZADZANIE in Polish No 4, Apr 86 pp 16-17

[Article by M.M. under the rubric "GUS Statistics": "The Research and Development Base of Industry"; the first paragraph is an introduction]

[Text] The crisis in Polish science is deeper than in other areas, which is certainly one of the causes slowing down the process of putting Poland's economy back on track. A lot of interesting data on this phenomenon are contained in the publication issued by GUS [Chief Statistical Office] in November of 1985 under the title "Polish Science in 1973-1984" prepared in connection with the holding of the Third Congress of Polish Science.

The share of allocations to scientific research activities in Poland's GNP is substantially smaller than in other socialist countries (fig. 1). It is true that after 1983 this share grew somewhat: According to planning documents in 1984 it amounted to 1.4 percent. This was, however, still less than the spending in other socialist countries before 1983. The same planning documents (the central annual plans for 1985 and 1986) provided for a growth of research and development allocations up to 1.7 percent of GNP in 1985 and up to 2.2 percent in 1986. It seems, however, that these plans will not be fully carried out. Although the annual funds earmarked for research and development (including the Fund for Technological Progress) are now somewhat larger than in the previous years, they are not always utilized fully and for their planned purposes.

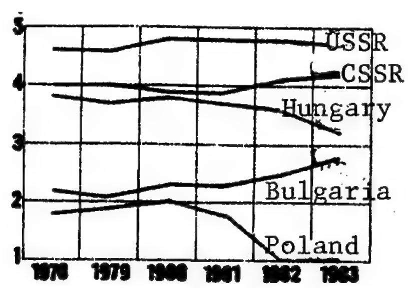

Fig. 1

This is also indicated by a reduction in the number of research workers in the research and development sphere, as illustrated by figs. 2 and also 3 and 4. It is seen from fig. 4 that in most countries the number of these employees per 10,000 inhabitants has been growing steadily. The sole exception was Hungary, where this employment sector declined somewhat between 1980 and 1981, althrough already in 1982 is stabilized. In Poland, however, unlike in any other of the countries taken for comparison, the employment in scientific research and development sphere has been declining steadily from 1978 to 1983.

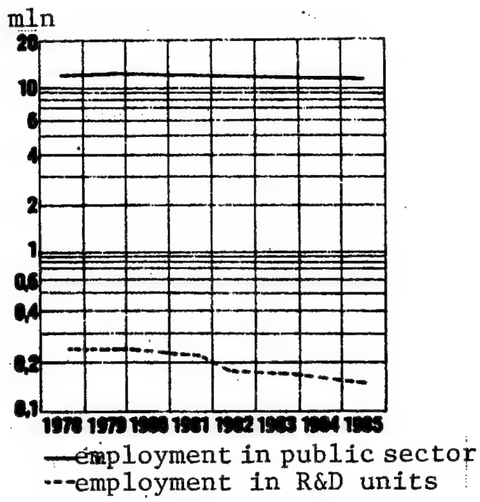

Fig. 2

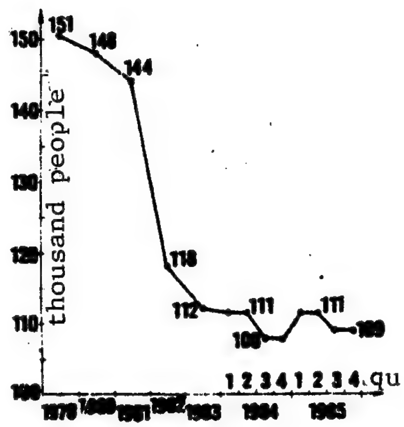

Fig. 3

The decreased employment figures for scientific research and development units as compared with the employment figures for the entire public sector of the economy in Poland between 1978 and 1985 are shown in fig. 2. It is

seen from this figure that the employment in the public sector of the economy over this period dropped by almost 4 percent, while in scientific research and development units it tumbled by almost 40 percent!

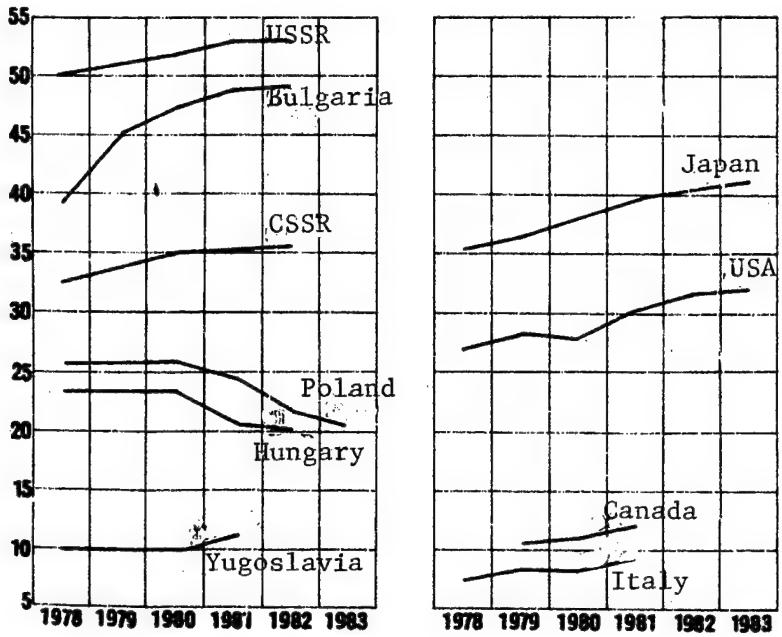

Fig. 4

The statistical yearbooks and bulletins published by GUS give employment data only for the units counted within the departments of science and technological development, namely, the units subordinated to PAN, ministries and industries, as well as scientific, technical and economic information centers, special libraries, etc. (but not counting the research and development facilities at industrial enterprises). As can be seen from fig. 3, in these units the employment has also dropped from 150,000 in 1978 to 109,000 at the end of 1985, that is, by almost 28 percent.

It is also seen that until 1984 the reduction of employment at scientific research organizations mainly concerned individuals without a college degree. Although the number of people with a degree has also decreased, the relative reduction was smaller. At the design and development organizations, however, the situation was worse, and there the number of employees with degrees dropped by 1984 as compared with 1983 by 58.5 percent, with the total reduction of employment amounting to 68.3 percent. This is evidence of the weakening of this sphere, which is crucial for introducing the results of scientific research into the practical economy.

The drain of manpower from scientific research units can be partly attributed to the worsening of the remuneration rates in science and technological devel-

opment spheres as compared with other sectors of the economy. Figure 5 illustrates this by comparing the average monthly salaries in science and technological development spheres with the public sector of the industry. It is seen that as late as in 1978 the salaries in science were by about 6 percent (about 300 zlotys monthly) higher than in the industry. By late 1985, however, the salaries there were by almost 14 percent lower (about 4000 zlotys) than in industry.

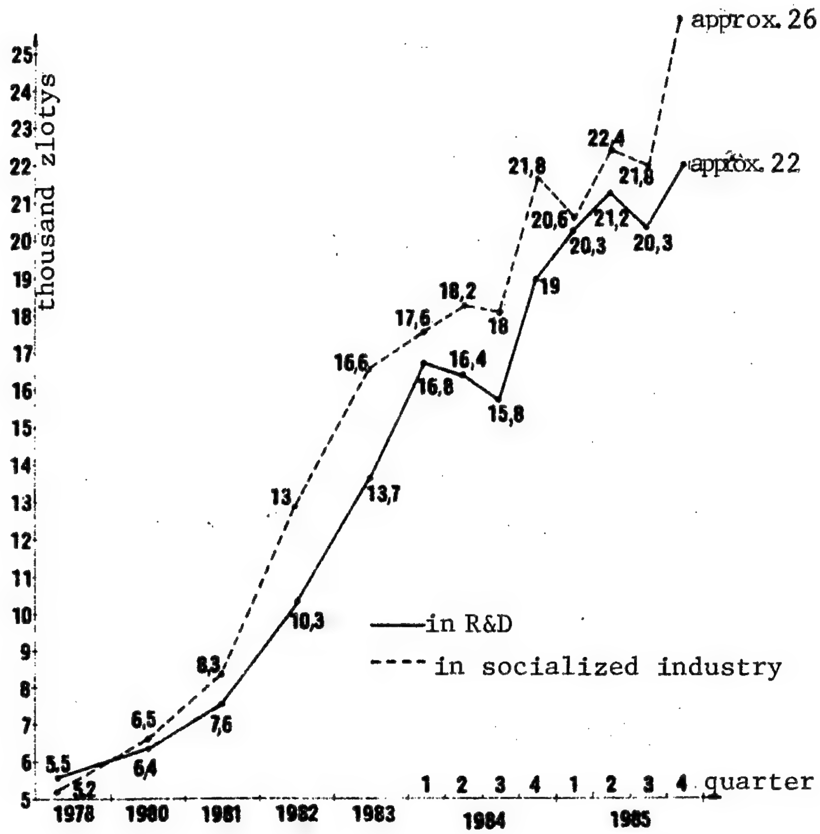

Fig. 5

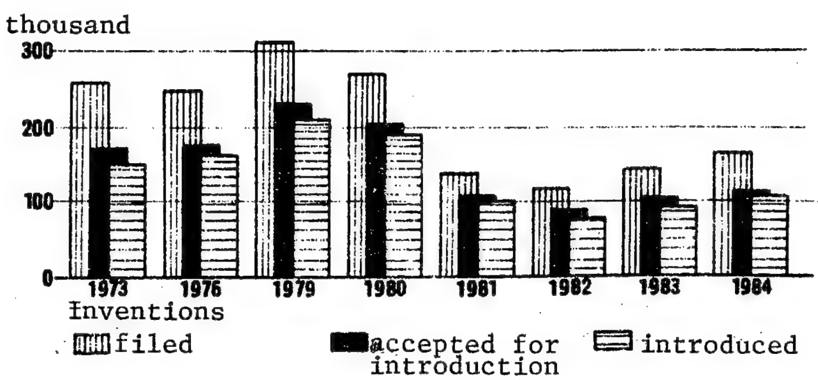

Fig. 6

One of the consequences of the damage suffered by science is the deterioration in the introduction of the results of scientific and technological progress into the economic practice. Figure 6 illustrates this phenomenon by the drop in the numbers of invention claims filed and inventions accepted for use and introduced into industrial practice.

[Sources of data in illustrations: "Nauka polska w latach 1973-1984" [Polish Science in 1973-1984], GUS, November 1985; BIULETYN STATYSTYCZNY GUS, Nos 7, 10, 1985, figs 3, 6]

9922
CSO: 2602/40

EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

CONTROVERSY AT HUNGARY'S PHYSICS CENTRAL RESEARCH INSTITUTE VIEWED

Budapest MAGYAR TUDOMANY in Hungarian No 4, Apr 86 pp 308-313

[Reprint of interview with Ferenc Mezei, published originally in KFKI HIRADO, No 10, 1985: "The KFKI Is a National Asset"; date, place, and occasion not given]

[Text] [Question] You have returned home from West Berlin for a few days, into the very middle of a great controversy over the formulation of strategy. We take this opportunity to ask you: How do you see the present situation of the KFKI [Physics Central Research Institute]?

[Answer] The KFKI has unquestionably reached a turning point. There may be a number of reasons for this. Basic among them is that economic conditions have become more difficult. Especially in the sense that the KFKI--in a departure from its original research mission--must partially earn its keep in the marketplace. Thus it is understandable that the question has arisen as to whether the maintenance of a research center makes any sense today. This is the question that the present controversy reflects. In my opinion, the KFKI is a national asset. Primarily in a cultural and moral sense. By this I mean that, regardless of how nice and good are the things we develop for the market, we are not the only firm able to do so. Furthermore, it is not yet clear whether we will be able to salvage, and to carry over into a market with tougher quality requirements, our results to date that have stemmed essentially from an advantageous monopoly situation.

In the domestic economic arena, which is recovering vigorously (but is unable nonetheless to fully compensate for the worsening state of our foreign markets), the KFKI will need to be more flexible and faster in future. And henceforth we cannot afford to venture, in the hope of quick profit, into areas that do not require the intellectual, research background and experience which our country eminently has. In any event, we can be certain that market conditions will not again become easy for us, and this is something we must face. Because our prospects in our own field are brighter than in other fields, it is better for us to compete in our own field.

As I see it, an essential part of solving our dilemma is that we must concentrate on marketing technologies and products which are competitive also internationally. Specifically because of our research background, intellectually and morally we are (still?) capable of this at present, as evident also from

the examples which can be cited to support this contention. At the technological and intellectual level where the KFKI has an advantage over industry, it would not be possible to prosper solely in the domestic market, even in a country the size of Great Britain or the Federal Republic of Germany.

To sum up my opinion, the cultural mission of the KFKI should not be contrasted with its partially self-supporting presence in the marketplace. Rather, a way must be found for these two aspects to mutually aid and reinforce each other.

[Question] What is your opinion of the ongoing controversy within the KFKI?

[Answer] Many important ideas have been advanced in the debates. In my view, what we have encountered so far are mainly well-meaning and responsible expressions of concern for the institute's future. But there are many things that are objectionable in terms of their form, and some things have even caused serious harm. We have begun to score against our own team.

Incidentally, we have reached the point in the controversy where there is hardly anything more to be said that would be meaningful. Now is the time to digest everything, but only within the walls of the institute.

[Question] Do you feel that the present concept-formulating disputes have become excessive or have turned into squabbling?

[Answer] It appears that a somewhat malicious preoccupation with one's colleagues is a central European phenomenon that is beginning to manifest itself strongly even in the Federal Republic of Germany, and to a large extent it is paralyzing research there as well. But (for the time being?) there is still ample funding for research, and the paralysis can be offset with millions of marks. (Many people find it intriguing that research results of the same level cost far more in the FRG than farther west; the explanation of this should be sought, in my opinion, also in the useless squabbles.) In themselves, the present disputes and other excessive measures are understandable in the given situation. But we must also realize that, in the long run, the excessive disputes instead of research work, and the finger-pointing at one another or upward, will even contribute to our present problems.

On the other hand, in my opinion, there is also the question of loyalty, something that is generally lacking here at home. I feel that a worker can be expected to remain loyal to his institute. Or at the management level, for example, loyalty both upward and downward is not only a question of integrity, but a primary requirement of professionalism as well. A manager who does not agree with his superiors can do only one thing: resign quietly. And his resignation must not be regarded either as punishment or a demonstration. It simply means that a manager should not undertake work that he is unable to perform with full conviction. There is nothing worse than a divided management with counteracting measures. Incidentally, it is high time to take seriously the appointment of managers to fixed terms, without automatic promotion by seniority. Managers "returning" to real research should become a common occurrence. This problem, regrettably, has also sensitive financial aspects.

[Question] But what happens when a middle manager or a simple staff member is "fully convinced" that he is right, that it is necessary to proceed in the direction he deems fit?

[Answer] We often speak of democracy, but everybody interprets it differently. Yet we all have learned the principle of democratic centralism, and many of us are generally familiar with the highly successful international corporations in whose operations this principle asserts itself fairly well. Let me sum it up briefly: there is democracy in presenting proposals, expressing opinions and in control, but not in decision-making! According to the familiar adage, the camel is a purebred Arabian stallion designed by a committee. And at our [institute] the situation is perhaps best described the way one of my colleagues, a professor on the Faculty of Natural Sciences, put it the other day: "We hardly ever employ centralism, and democracy is even rarer."

It is of course appealing that we have grand ideas on how to change the world. However, it will lead to nowhere if each of us wants to redeem the world, but in the meantime neglects his own work!

I think that here at the KFKI we have already done enough to redeem the world. It is high time for us to concentrate on our work, in a professional manner.

[Question] How would you describe a professional at the KFKI?

[Answer] The attributes of a professional are a high degree of competence, absolute reliability, and full assumption of responsibility. The professional is responsible with his neck for what he undertakes. And he produces results, instead of excuses. The professional performs excellently the work he is paid to do; he does not waste time and effort trying to prove what his neighbor ought to be doing better and why it is always someone else's fault that things are not proceeding the way they should.

By the same token, at the institute level the KFKI's task is not to formulate science policy in the government's stead, but to carry out to the best of its ability what it has been assigned. Here I have in mind the controversy over basic research and commissioned "research" that brings in fees. Admittedly, under ideal conditions, the aspect of earning money is foreign to a research institute. But in the present situation, since it has evolved historically the way it did, earning money must be regarded as necessary. However, it is our duty to spend on basic research exactly what we have been allotted for that purpose; not more and not less. And let us spend our fees for commissioned research on such research. Let us fulfill our contracts on schedule and produce useful results, instead of sham results.

From what we earn in the marketplace, in other words, let us not attempt to "support" more basic research than what we have been assigned, through financing. Even more serious would be to misappropriate the allotment for basic research, and to spend it on commissioned research or production activity.

[Question] Does a manager, researcher or worker at the KFKI have any incentive at present to work as a professional, and to turn the KFKI into a professional institution?

[Answer] Any other solution would be worse. Academician Vamos mentions in MOZGO VILAG that we are losing 10 percent of national income because of poor telephone service. If we add to this the percentages of the losses due to lax labor discipline, unreliability, slippages, and the inefficient and excessive bureaucracy, then we can speak of losing as much as 50 percent. In America (to maximize profits) much time and effort has been devoted to studying why people work well. And the unambiguous answer in the citadel of materialistic thinking was that people are motived to work well not by the money they earn. The driving force is job satisfaction, the advancement that work can ensure for the worker. This of course should be interpreted to mean that meanwhile the worker earns enough not to feel shortchanged under the given social system. This is why the forms of financial incentive that are customary in our country are not being used there.

We have been saying for a good many decades, "The factory is yours. You are working for yourself." But mainly the Japanese have been able to turn this into practical reality. Japan has achieved that most workers are attached to their workplaces, look on their company as their family, and are motivated--let us dare to frankly admit--also by a degree of patriotism. Of course, they are also paid well, but this does not mean that good pay provides their short-term motivation. The workers know that they will share in the company's total income, and therefore their objective is to increase this income. The "quality circle" movement (essentially an efficiently operating form of the socialist brigade movement) plays an enormous role. Through it, numerous industrial engineering and innovation proposals are being introduced on the workers' initiative. The Japanese are attaining these high levels of productivity and labor discipline under life-long job security, while in America the aspiration to hold onto one's job achieves the same thing. In Europe, neither East nor West Europe has found a solution to this problem halfway between Japan and America, by combining the two methods. Upon deep soul-searching, we will all admit to knowing that an overwhelming majority of KFKI workers remain loyal to the institute not because of what they earn, but because they love the KFKI, are satisfied with their jobs, and are proud of the KFKI's research results. The technicians working for the KFKI are doing work well above the nation's technological average and could certainly find better-paid jobs elsewhere, yet they are staying. They are able to work (also) to the highest international standards, examples of which I do not wish to cite here. I feel that in the KFKI, too, we have to rely on the conscientiousness, pride and job satisfaction of the researchers and workers, while ensuring that they are paid what their good work deserves in relation to the national average wage level. We must not commit the mistake of thinking that one pull on a file is worth one forint, two pulls are worth two forints, and so on. The domestic system of rewarding inventors is the best example of what horrible damage an approach of this kind can cause. Any perfunctory incentive system is bad, but this system is outright catastrophic and, in my opinion, one of the basic causes of the paralysis of technological development and innovation in Hungary. It rewards the fictitious utility of inventions, instead of providing an incentive for actual economic results. Regrettably, we at the KFKI are unable to change this system. And although a majority today still subscribes to an erroneous standpoint on this issue, sooner or later the statutory regulation that is paralyzing technological progress will have to be changed nationally! In the case of inventions

that employees discover in the course of their regular duties, the employees are entitled only to the customary bonuses for good work, over and above their regular pay. Any additional remuneration would be immoral and would only encourage sham results.

[Question] All right, we are not working mainly for the money. But salaries today are below a level that could be regarded as satisfactory. Thus even a KFKI staffer is often forced to earn elsewhere, or by doing something else, the extra income he needs.

[Answer] Yes, indeed. This is the vicious circle of "they pay, we work," and "they work, we pay." A country is able to pay out only as much income as is produced. If more income is paid out, there is nothing to buy with the money. If less income is paid out, the merchandise does not move. This is why the business partnerships have been of enormous importance also nationally. Because they represent more work, and hence also more merchandise. As everything new, of course, also the business partnerships have their growing pains. As established also at the KFKI, the business partnerships may adversely affect performace during regular working hours, not everyone can participate in them, etc. But we must not be impatient. A sound balance will evolve after a time, when the business partnerships will have more capacity than the volume of work that can be farmed out to them, and then a real competitive situation will emerge. It is a considerable management task to maintain sound proportions and to ensure that the business partnerships' activity does not adversely affect performance during regular working hours.

[Question] Are people working more abroad?

[Answer] Contrary to what is generally believed, the work intensity in West Europe is not high. Of the 35 to 40 hours clocked per week, 20 to 25 hours are honest work, regarded as steady. One becomes conspicuous only if he works more or less than this, and the trade union will frown on him in either case. I hesitate to resort to estimates of how things stand in Hungary. But when we speak of working time, nobody has 8 hours of actual work in mind, unless he happens to be a researcher, for example. Anyone who wants to succeed in this profession must work far more than 8 hours a day. There is no exception to this rule, here or elsewhere. In the developed countries, fewer than 30 percent of the total number of persons gainfully employed are able to produce even so the affluence that already exceeds rational limits. The others ensure the working conditions (management, organization, services, etc.) for this 30 percent.

[Question] Then let us return to home waters. Aside from low pay, one of the main complaints at the KFKI is that the working conditions are not organized efficiently.

[Answer] Today it is essentially management's task of foremost importance to ensure that anyone who works is able to do so efficiently and with high morale! All other bellyaching is of secondary importance. It is clear to anyone familiar with the mood at the KFKI that there is room for improvement in this respect. It has often been said that organizational changes are necessary. Reorganizations, the shuffling of chess figures, do indeed create the illusion

that something is really happening, but often they merely serve to prove the need for the next reorganization.

The present organizational forms of the KFKI and its voluntary public organizations are suitable to successfully perform the set tasks, and we only have to know how to use them. The financing of research topics can serve as an example. Do we need something better? No, we do not. Ideally, the present system of financing research topics means that the small teams working on the topics know one another well, are aware of what is available, how much they can spend, and what they have to accomplish. But how does this system work in practice? A young researcher told me that he would prefer to get only half the money that can be obtained by begging and maneuvering, provided he can count on the money and it will not be diverted by others for other purposes. Of course, real financing of research topics also presupposes that, above and below, the managers and the managed do what they have been assigned to do. But this requires a suitable overview; in other words, a good flow of information must be ensured as the first prerequisite for a good working environment within the institute. The mentioned researcher could then know how much he has been allotted, how much the others got, and he would realize that he has not been shortchanged, for example. This might also include (let us not underestimate our researchers) his acceptance of getting less or nothing at all. I, too, have worked on such research topics, and it is obvious that every topic cannot be supported equally. However, all this will be possible only if the institute's long-range concept has been clearly formulated, is known to everyone, and we spend our money in this spirit, rather than on the basis of other considerations. On this basis, the squabbling could be replaced by good morale that would make it worthwhile to walk up the hill.

[Question] Do you mean the system of competing for research grants?

[Answer] It has already helped a lot. But it is not the only source of research money, fortunately. Because, from long years of experience, I do not have much confidence in committee physics. Committees rarely approve anything that is truly promising. On the other hand, numerous outstanding results have been produced by teams with little money to spend. While the most amply endowed teams have not produced anything besides victory announcements and listings of nonexisting objective difficulties.

[Question] Thank you for the interview. In conclusion, could you perhaps tell us how do you think of the KFKI when you are working in Grenoble or West Berlin?

[Answer] During a decade on fellowships in the West, I often wished that it were possible to work with a team from home, instead of "these Westeners," because then we could beat everyone hands down. This is no exaggeration. Considered individually, we have many outstanding people. It is no accident that a staff member of the KFKI has been accepted for my place in Grenoble, from among ten applicants. Not because I recommended him, but because he was truly the best. This inspite of the lamentable educational situation at home! But we have not yet been able to achieve that a domestic team be worth more, and not less, than the sum total of its individual members.

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EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

GDR PHYSICS SOCIETY DISCUSSES KEY TECHNOLOGIES

East Berlin SPECTRUM in German No 4, 86 pp 28-29

[Article by ordinary member of the GDR Academy of Sciences Joachim Auth, Humboldt University at Berlin: "Annual General Conference of the Physics Society"]

[Text] This year's annual general conference and educational conference of the GDR Physics Society took place right before the SED 11th Party Congress in February.

We physicists are faced with the task also of using the advantages of socialism even more to accomplish the scientific-technical revolution and to develop in an even closer way the organic linkage of science and production. In this connection, significant innovations are the goal, but these can be brought forth only by a basic research that looks far into the future. A basic research that leads to those peak achievements that can be economically utilized considerably more fruitfully. Therefore our basic research must concentrate on the focal points and main orientations of those scientific fields and key technologies that can be perceived at present as being the most important. Such key technologies include those technologies that are formulas for scientific-technical progress together with a long-continuing powerful economic growth. Microelectronics and optoelectronics, modern computer engineering developed on the basis of these, automated designing and preparation of production, flexible automatic fabrication systems, new processing technologies, the utilization of new types of materials, and biotechnology are certainly some of these technologies. Thus, by means of its specific resources and by way of its individual and corporative members the Physics Society should make a distinctive contribution to the mastering of this course of action, which is not a simple one. The Berlin Television Electronics Plant VEB and other enterprises of the Microelectronics Combine as well as the NARVA Combine have proved to be pacesetters in this regard, with the concluding of their coordination agreements with Humboldt University. At the same time, in the working out of these coordination agreements it becomes clear that there are a number of objectively determined difficulties and problems, which must be overcome in joint socialist teamwork and which must not be further complicated by unduly differing subjective views of the problems. Here, the Physics Society can certainly be helpful in many respects due to its overall responsibility for physics in the GDR, and can be correspondingly

effective through its conferences. Thus, in Leipzig the panel discussion on the topic "Physics and High Technologies" met with a great response. Representatives from the Microelectronics Combine VE also took part in this discussion.

For this reason, even in the past we have always dealt in our conferences with topics that are important for the key technologies, and we will do so more than ever in the future. Our series on "Phase Transformation in Solid-state Physics and Materials Research" was aimed at new processing methods and new materials along these lines. The paper "Reliability Theory and Physics" (K. H. Mueller) was of very fundamental importance, since the question of reliability and degree of equipment availability in connection with large complex systems, which are more and more characteristic of the key technologies, must be approached with a great awareness of responsibility and at the same time rationally and constructively.

The Physical Society can act in a motivating way on its members and present ways to acquire the newest information on these topics.

What is important now is that the component of research not delimited by coordination agreements and performance agreements with a combine in its direction and objective should be oriented in such a way that all those needs arising from and for the sake of scientific development itself are satisfied as well as possible. Moreover, here the Physical Society should act as a scientific conscience with its colloquia and its conferences--through open and objective discussions it must be ensured that the level of research always measures up to the requisite national and international standards. The series on "Microelectronics" and "Nonconventional Microscopy" at the annual general conference can be seen as fitting in with this requirement.

Such fields as high-energy physics, fusion research, interstellar research, the chemical physics of interfaces, ultrasensitive measuring methods, and selected topics of theoretical physics also deserve particular attention. Research techniques and experimental and theoretical methodology have a strong effect on our overall technology and natural sciences, including medicine, without it being necessary for the main subject of such an endeavor in physics to be connected at all with the corresponding field. One example is the measured-value processing developed above all in elementary-particle or high-energy physics, which has permeated all of physics and chemical-composition metrology, and which in conjunction with computer tomography in medicine has thereupon led to a qualitatively new diagnosis instrument of very great practical importance. The methodological refinement of magnetic nuclear resonance spectrometry has stimulated a completely new chemical-composition metrology and structural-investigation methodology for chemistry on an international scale. Coupled with the computer tomography principle, this has led to NMR computer tomographs that have substantially expanded diagnosis possibilities in medicine.

Moreover, the Physical Society also should especially pursue general problems of strengthening the research and development process and other

cross-discipline problems, especially from the fields of microelectronics, nuclear-energy engineering, automation, and robotics, as well as problems concerning materials.

Of course, as a practical matter there are questions that cannot be assigned with complete clarity to one or another division of research. For example, the "Quantum Hall Effect" is certainly one of the key technologies--because of its connection with the further development of microelectronics by way of such factors as heterojunctions, two-dimensional electron gas, introduction of semiconductor materials, and achieving of maximum mobilities. Nevertheless it is uncertain to what extent it could dovetail on a high-priority basis into the current tasks of our combines. On the other hand, it has a great scientific importance, as surely can be inferred from the granting of the 1985 Nobel Prize. We as the Physical Society must also work on ensuring that the scientific perspective is developed everywhere and that no important developments in physics are overlooked, and that we are and always remain discerning with respect to what happens in international physics, even in those fields where for good reasons we are not conducting research ourselves. We ourselves are actively working on the Quantum-Hall Effect, as can be seen from the paper by R. Herrmann, among other things. He presented a very interesting survey on the results achieved internationally and on his own contribution to this fundamentally significant quantum effect.

It has proved useful for sociologists to speak at the annual general conference as well. We were able to bring in one of our most distinguished economists in the person of H. Koziolek, ordinary member of the Academy. He spoke on "Contacts Between Physics and Economics," and thus entered into a subject area of utmost relevance. For the first time, students' research achievements were presented at the conference by means of several posters, with these achievements also being the subject of the joint 11th Central Student Conference in Dresden.

The good tradition of the annual general conference of the Physical Society also includes the appreciation of particular achievements by means of our awards of the students' prize and the Gustav-Hertz Prize.

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EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

BULGARIAN CRYOGENICS EXPERT DISCUSSES DEVELOPMENTS

Sofia OTECHESTVO in Bulgarian No 3, 1986 pp 16-17

[Article by Angel Bonev: "Cryogenics: A Strategy is Needed"]

[Text] "Kryos" means "cold." The liquefaction of oxygen 100 years ago, and then of hydrogen and helium, together with the invention of effective methods of storing large amounts of liquefied gases, enabled scientists to attack the absolute zero problem. It was found that many interesting phenomena take place in the region of low and extremely temperatures, and that the properties of matter change beyond recognition.

Today all industrially developed countries are at work on practical application of the scientific results obtained in the field of cryogenics. In what direction is the most recent research throughout the world heading? Is it proper to speak of a "cryogenic basis" of future scientific and technical progress? What problems are being solved by Bulgarian scientists in this area?

We discussed these questions with candidate of physical sciences Petko Vasilev, head of the cryogenics laboratory at Kl. Okhridski University in Sofia. For many years he was a senior scientific associate in the cryogenics department of the United Nuclear Research Institute at Dubna in the USSR. He is the author of more than 50 publications in the field of low temperatures.

There is hardly an area of material production in which discoveries connected with the behavior of matter at low temperatures cannot be applied. Along with microelectronics and computer science, cryogenics has become the fastest growing area of current scientific investigation and learning.

The history of science abounds in "accidental" discoveries. They are most often made precisely when matter is under extreme conditions, such as extremely low or extremely high temperatures, strong magnetic fields, or enormously high pressure. But there must also be high professionalism, an unorthodox approach to problems, and modern research facilities. Luck also helps, of course, but it alone is not the decisive factor.

It sometimes happens that extreme conditions even cancel each other out, or so it would seem at first glance. For example, the plasma filament "burning" at a temperature of around 100,000 degrees Celsius can be created and

maintained in a thermonuclear reactor only by an extremely powerful magnetic field of complex configuration and large volume. A field such as this can be created exclusively by means of superconductive magnets at a temperature only a few degrees above absolute zero.

Application of extremely high pressure combined with low and extremely low temperatures makes it possible to transform non-conductors into metals and even into suprconductors. Liquid helium or hydrogen permits creation of the vacuum of outer space with relatively simple equipment and without the harmful contaminants that are inevitable with conventional vacuum systems.

The range of application of superconductivity at low temperatures is continuing to expand. Superconductive magnets are used for nuclear magnetic resonance in computer medicine in three-dimensional whole-body scanning. Such tomograms are even now serially produced; they offer enormous advantages over the conventional x-ray tomograms. Patients are not subjected to irradiation with harmful rays, and the image quality is much better.

Superconductive magnetic technologies are employed in separation of ores and colloids, in metallurgy, in treatment of seeds in agriculture, and in magnetic treatment of water. Magnetic therapy and magnetic surgery also have significant potential.

Cryogenics also has unlimited potential in the area of electronics. The density of elements in integrated circuits operating at low temperatures could exceed 10 million per square centimeter. Thermovisors can be used for remote location of the temperature fields of the human body or of technological objects not accessible to direct measurement. The superconductive quantum interferometric devices used both in medicine and in geological exploration (for locating useful minerals by remote scanning of magnetic profiles), in metrology and standardization, astronomy, and precision measurement are of astonishingly high quality.

In other words, we can confidently say today that we have a cryogenic foundation for future scientific and technical progress. This finding is also confirmed by the achievements made throughout the world in this area.

Bulgaria has two cryogenics laboratories, one at the Institute of Solid State Physics under the Bulgarian Academy of Sciences and the other in the physics department of Kl. Okhridski University in Sofia. A group of specialists at the Institute of Electronics under the Bulgarian Academy of Sciences is also working on some of the problems associated with cryogenics. The scientists of the three establishments also cooperate actively with well-known international scientific centers, including the International Laboratory of Strong Magnetic Fields and Low Temperatures in Wroclaw, Poland, and the United Nuclear Research Institute in Dubna, USSR.

Good results have been achieved in study of radiation effects and critical effects in superconductors and superconductive magnets, in study of quantum fluids and crystals, especially in strong magnetic fields and at extremely low temperatures, in experiments in the area of low-temperature properties of amorphous and crystalline magnetic materials, with radio-frequency superconductive quantum interferometers, and in nuclear magnetic resonance spectroscopy, in which superconductive magnets are used.

The achievements of Bulgarian scientists have been recognized by the most authoritative forums around the world and have been published in famous international scientific journals. But is this enough? In my opinion, our judgment should be based on the role of current achievements in the future development of science, as well as on the contribution made to practical application of developments.

Modern cryogenics requires generous financing, and this financing involves a relatively high risk factor. This is normal for such a vigorously growing branch of human knowledge. Financing in such a small country as is Bulgaria must be carefully considered, of course. This also applies to the training of personnel to work in this field.

We nevertheless believe that we could do more in development of low-temperature science and in practical application of the results of this science. I wonder, for example, why we do not have at least one higher educational institution in Bulgaria at which a course in cryogenics is taught. Nor is the subject taught in intermediate schools. In view of this situation, how are we to start a tradition? Even if we have an enormous amount of material resources available to us one day, without personnel and traditions, without high professionalism, we will be unable to develop scientific and technical progress in the low temperature field.

What is to be done now at the beginning of the 9th five-year plan?

In my opinion we ought to evaluate the very favorable trends in cryogenics throughout the world, in order to work out a strategy for its development in Bulgaria, and we should secure the necessary material and personnel resources with which to carry out this development. At the same time, the State Committee for Science and Technical Progress and the Bulgarian Academy of Sciences should coordinate their efforts to determine where the scientific results achieved are to be applied.

Specialization in cryogenics should be introduced as part of the engineering physics specialty at Sofia university. The facilities for postgraduate specialization in low-temperature problems can be considerably expanded. We are also capable of training elite cadres under the postgraduate research program.

I have worked at Sofia University for more than 10 years and I am convinced that significant achievements can be made here as a result of close coordination of action between teachers and students and between science and practice.

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